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PERFORMANCE OF SMALL SCALE WATER MANAGEMENT PROJECTS IN BANGLADESH: SOCIOECONOMIC APPRAISAL OF BARANAI RIVER PROJECT

QUAZI SHAHABUDDIN*

With contributions from :

Shahidullah Talukder
Parvin Sultana

February 1995

Price Tk. 75.00

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The members of the Project Team spent several months in the project area during 1992. In the course of their work, they received whole-hearted cooperation everywhere. I would like to take this opportunity to express my thanks to all those concerned. Special thanks are due to Mr. M.A. Mannaf Majumder, Director, Planning Schemes-II (ADB), BWDB, Mr. Muraduzzaman. Executive Engineer, BWDB and other officers and staff of the field offices of BWDB, Chairman and members of the Union Parishads in the survey areas and Thana level officers and all others who provided their support and extended their cooperation in the conduct of this study. Thanks are also due to my colleagues of the BIDS-SSISP Research Team, as well as those who provided excellent assistance in computer programming, word processing, and in carrying out the field survey and subsequently in the tabulation of data (names are listed at Annex-1 of the Report).

The working paper is a part of the report on the BIDS socio-economic evaluation study of Small Scale Irrigation Sector Project (SSISP), in Bangladesh. I would like to thank the Delegation of the Commission of the European Communities for conceiving and subsequently providing financial support for this study.

Quazi Shahabuddin
February, 1995

EXECUTIVE SUMMARY

Background

The Small Scale Irrigation Sector Project (SSISP) was conceived within the Medium Term Foodgrain Production Plan (MTFPP) under the Second Five Year Plan of Bangladesh. Within the MTFPP, the Small Scale Irrigation Sector Project was designed to contribute to increased food production in the country. This was sought through implementation of small sized projects comprising the construction and rehabilitation of flood protection and drainage facilities, and installation of minor irrigation equipment such as low lift pumps, shallow as well as deep tubewells. SSISP was planned to encompass 31 sub-projects scattered over different regions in Bangladesh. The sub-projects were planned to be implemented in phases, broadly in four cycles. Baranai river sub-project is one such project and was implemented during the first phase of SSISP. The physical works of the project was commenced in 1982/83 and completed in 1985/86. The project was financed by the Asian Development Bank and the European Economic Community.

Location

The project is located adjacent to the Baranai River at Naldanga near Natore in Rajshahi district (old). It is adjacent to and situated north-west of Chalan beel Polder B. The project covers a gross area of 5,080 hectares. The topography of the project area is generally flat with elevation ranging from +34.00 RL to +46.00 RL.

Project Objectives

Historically, the project was subject to annual flooding during the monsoon season. Also, inadequate drainage during the months of October and November, particularly in the north-west part caused problem of waterlogging in the area. The project objectives were to provide protection against monsoon flood, improve the interior drainage system, and provide irrigation facilities with a view to increase agricultural production. The improvement in the cropping pattern is to be achieved with protection against (early) flooding and reduction in the depth of standing water during the monsoon. This was supposed to be attained by the

of standing water during the monsoon. This was supposed to be attained by the construction of full flood embankment along the Baranai river. The irrigation is to utilize as much as possible water in the Baranai through the operation of low lift pumps. The rest of the irrigation is to be provided using ground-water through shallow and deep tubewells.

Project Structures and their Effectiveness

The main features of the project are embankment with closures, regulators and drainage channels. The project has a full flood embankment with a total length of eight (8) miles. The height of the embankment along with adjusted 3 feet free board was selected on the basis of 100-year flood event. The overall condition of the embankment is good, although it is subjected to public cuts, rain cut. breach, erosion and rat holes. Except the public cuts, others are not so serious. Since the route of the entire embankment did not follow the river bank, people living in between the river bank and embankment are exposed to the hazards of floods. The public, therefore, cut the embankment for their own safety and security, but causing floods in the project area. Also, the project has experienced floods several times in the past due to the breach of the embankment at several places, where the embankment followed the river bank. At these places, river water exerts a high pressure on the embankment causing severe erosion and scouring. However, the embankment was never overtopped by the flood water after its completion.

An excavation of 19 km of drainage channels has been accomplished, as per design specification. However, the drainage channels are now partly silted up, and therefore, needs re-excavation for proper functioning. Four regulators each having single vent with vertical gate have been constructed on the embankment. The gates are in good operating conditions. But all the gates were found to be leaking profusely as their rubber seals have been torn or washed away during operation of the gates. The gate operating arrangements were observed to be generally good.

Hydrological Impacts

The direct impact of the project can be conceived in terms of hydrological changes, which is primarily reflected in the pre- and post- project flood

conditions. In fact, the intended objective of project intervention by way of reduced depth and duration of flooding seem to have been largely achieved. It was observed that the percentage of cultivated land inundated for more than four months is much lower in the project area, as compared to the control area. However, drainage congestion in some parts of the project area (the areas under Bashbhag regulator, which was constructed on the Hoja river) tend to limit the hydrological impact.

Operation and Maintenance

The decisions concerning operation of the gates were taken by the Regulator Committee, through participation of the beneficiaries. The gate Khalashi appointed by the project authority opened and closed the gate on request by the farmers. The regulators as observed during the field visits were easily operable. This was confirmed by the BWDB officials and the beneficiaries interviewed.

Need for maintenance work carried out by BWDB was assessed through inspection, survey or by observing the unsatisfactory performance of the structures. Petty repairing was done to flush sluice, and the gates were painted and greased for smooth functioning as and when necessary. There were leakages through the gates. In order to stop the leakages, the sides and bottom of the gates should be sealed by rubber, which is usually washed away due to high pressure exerted by the water during the opening and closing of the gates. Discussion with BWDB authority indicate that the embankment and closures so far were repaired thoroughly only once. Sometimes they were repaired under Food for Works (FFW) programmes. Some maintenance work such as re-excavation or deepening of the main canal and drainage canal, remodelling and resectioning of embankments, and repairing of embankments and closures were done during the previous years. These should be done on a more regular basis, preferably annually. Field canals were maintained by the beneficiaries themselves.

Impact on Agricultural Production

Following the implementation of the project, the overall agricultural situation in the area has undergone considerable changes over time, particularly compared to the pre-project situation. Although the changes in cropping intensity has been marginal, the paddy production has increased significant

level by several thousand metric tons. This is largely due to expansion of HYV aman and boro acreage in the project area. However, not all of these changes can be attributed directly to project intervention. Some of these changes are autonomous, and have occurred in the control area simultaneously. The expansion of irrigation facilities particularly the installation of STWs has been initiated by the private sector in both the project and control area.

However, the project has attained considerable success in protecting the monsoon crops and bringing about a shift in cropping pattern in favour of HYV in the aman season. This is reflected in both the average yield and acreage devoted to the cultivation of aman crops in the project area as compared to both the control area and the pre-project situation. The percentage of net cultivable land devoted to the cultivation of HYV aman has increased by about 15 per cent as compared to the pre-project situation, and is about 22 per cent higher than that attained in the control area. There is, however, scope of further expansion of HYV aman through removal of drainage congestion in the north-western part of the project area. Drainage problem is also partly responsible for the low coverage of rabi crops, particularly cultivation of oilseeds in the project area.

The cropping intensity is only marginally higher than in the pre-project situation, and falls short of the target by a considerable margin. Cropping intensity it may be emphasized, is a poor indicator of overall crop production, when low-value crops are substituted by high-value crops in different seasons. This is exactly what happened in the Baranai project area when more profitable HYV boro has replaced both HYV wheat and aus, as a result of which total gross cropped area, and hence cropping intensity has been much lower than what has been targetted earlier. However, cultivation of profitable crop in one season while keeping the land grossly underutilized in other seasons may not generate sufficient farm income to meet the needs of the households. The lower farm income per household derived from crop production in the control area amply testify to this.

Impact on Other Agriculture: Forestry, Fisheries and Livestock

There has been considerable negative impact on the pasture/grazing area, and availability of animal feed and hence on the supply of livestock particularly cattle in the project area. Similar is the case with open water capture fisheries, which also registered a decline following the construction of embankment and other project structures, presumably due to reduction in water bodies and blocking of fish migration routes. No compensating benefits in terms of promotion of culture fisheries has been derived despite improvement in flood-free environment. However, both fruit as well as commercial trees have expanded in the area following the implementation of the project.

Impact on Land, Credit and Labour Markets

The distribution of land is observed to be more unequal in the project area. The Gini coefficients of land concentration are computed to .75 and .49 for the farm households in the project and the control area respectively. Nearly 45 per cent of households in the project area do not own any land as compared to 20 per cent in the control area. Most of the cultivable land is fragmented into tiny plots with average size of 0.20 hectare in the project area and 0.28 hectare in the control area. Owner-cultivator is the dominant form of tenancy in the project area while the majority of households in the control area are owner-cum-tenants. Hardly any pure tenancy is observed either in the project or in the control area. Share-cropping is the only mode of renting-out of land prevalent in both the project and the control area. However, in case of rented-in land, various forms of leasing are prevalent through which the process of transfer of operational rights takes place. Nevertheless, share-cropping still emerges as the dominant mode in the both the project and control villages. Even in case of share-cropping, alternative systems exist, particularly in the project area. Land transactions -- both sales and purchases -- are observed to be more frequent in the project area than in the control area. Also, land purchases have considerably increased in recent years. Moreover, not only the absolute prices of all categories of land are much higher but land prices have also increased more in the project area than in the control area. This is possibly due to more frequent transactions, and expected productivity gains perceived by people due to project intervention.

The share of institutional sources of credit is observed to be very low in both the areas. Non-institutioned sources clearly predominate, both in terms of coverage and the amount of loan. In terms of use of credit, non-agricultural productive activities dominate among the households in the project area. In the control area, on the other hand, credit use is mostly concentrated in agricultural productive activities.

The average number of earners is very similar in both the areas thereby casting doubt whether the project contributed towards expansion of earning opportunities. On an average, the heads of the households worked for 327 days in the project area compared to 309 days in the control area during the survey year. Similarly, for all working members taken together, the number of days worked are also higher in the project area. However, this is due to the greater working opportunities in non-agricultural activities in the project area as reflected on the greater number of days devoted to such activities. However, the seasonal pattern of employment indicate that the seasonality (in terms of number of months characterised by slack activity) observed to be less pronounced in the project area reflecting some positive impact of the project on labour utilization. It is also observed that the percentage of villages having more that 30 per cent unemployment rates have declined in most months of the year during the post-project period as compared to the pre-project situation. This implies that there could have some positive impact of project activities on the employment situation in the area. Moreover, the wage rates have increased at a faster rate in the project area with consequent beneficial impact on wage labourers.

Impact on Education, Health and Nutrition

Both the average rate of literacy and the level of educational attainment is higher in the control areas as compared to the project area. The conclusion remains valid when we consider the literacy of all members of the households and current enrollment rate. One cannot, however, attribute any project related difference in overall educational attainment in the sample.

The incidence of stomach related diseases has registered an increase in the majority of the villages in the project area. This may be traced, at least partly to the increase in waterlogging, accumulation of water hyacinth and water related

problems caused by the project. However, the incidence of other diseases investigated has either remained static or declined in the majority of the villages surveyed.

Except in case of homestead vegetables, few of the households reported increase in the levels of consumption of major food items. This is particularly pronounced among the households in the control area. A large proportion of households in both the areas has reported a decline in the consumption of fish. On the whole, it would appear that the project intervention could only have some marginal positive impact on the level of food consumption, and hence on the nutritional status of the people in the area. The peak of food shortages is experienced in the month of Chaitra in both the project and the control area. The other months of severe shortages are Kartik in the project area, and Falgun and Baisakh in the control area.

Socio-Economic Impacts

The demographic characteristics points to both higher average family size and size ratio among the households in the project area compared to those in the control area. The family members in the minor age group of 0-14 years constitute about half of all members in both the areas. In the project area the dependency on non-agriculture occupation is greater -- about 35 per cent in self-employment and another 15 per cent on wage employment. In the control area, on the other hand, about two-thirds of the heads of the households are engaged in self-employment in agriculture, while another 14 per cent in wage employment. The dependency on non-agricultural occupation is much lower. About one-third of male and about one-fifth of female reported changes in the occupation following the implementation of the project. However, whether such changes could be attributed to project intervention remains unclear.

The households in the project area report about 16 per cent higher income per household, and 4 per cent higher income per person than in the control area. However, this difference should be attributed to the large difference that exist among the top income categories. In the low and middle income categories, there is hardly any difference in average household income between the two areas. Top 20 per cent of the households received about half of the total income in both

the project and the control area. The overall income distribution, however, is observed to be more skewed in the project area as reflected in the higher Gini concentration ratio.

Agriculture provides about half of the total income in both the areas, in which crop production dominates contributing nearly 40 per cent of the income earned. All households own productive assets in both the areas. In case of non-agricultural assets a larger percentage of households is observed to own them in the project area than in the project area. Average value of agricultural productive assets has been higher among the farm households in the project area, though the difference has been narrowed down following the implementation of the project. In case of non-agricultural asset, however, the average value has been higher in the control area, though again the difference is much smaller as compared to pre-project situation. Draught animals represent an important asset among the farm households in rural Bangladesh. The average number of draught animals owned seem to have declined in both the areas. The decline is more pronounced in the control area.

The average household expenditure in the project area is only slightly higher than in the control area. The distribution of expenditure on broad categories displays more or less similar pattern with food items claiming the lion's share in both the areas. Expenditure on productive investment are quite low in both the project and control areas. The overall expenditure pattern among the households in the project and the control area, therefore, reflect no substantial difference that could be attributed to project intervention. The results of self-assessment of the households on their status in terms of surplus/deficit situations over the year indicate that the households in the control area appear to be favourably placed both with respect to surplus as well as deficit position throughout the year. However, the percentage of households who consider themselves (more or less) balanced are considerably greater in the project area. Finally, the incidence of extreme poverty would seem to be quite low in both the areas. However, this can hardly be attributed to project intervention.

Some beneficial impact of the project have been reported by certain non-agricultural occupation groups such as rice-mill owners, rickshaw/bullock cart

owners, mechanics and repairers etc, while for most other occupational groups the project did not have any noticeable impact on their activities. A large number of villages, on the other hand, have reported adverse impact of the project on fishery and water navigation. It is observed that the amount of sale is about 10 per cent higher in the project area than in the control area, indicating greater activities of trading sector in the former as compared to the latter.

Situation of Women

It appears that the project impact on the village economy has created some changes in the lives of women in the project area. Changes had occurred in terms of higher workload in crop processing activities thereby reducing women's leisure time. The increased workload has been associated with greater access to cash earnings by women. Women's access to food and clothing, however, does not show any large difference between the households in the project and the control area. The status of women also have not changed in terms of greater independence in decision-making.

Impact on Environment and Livelihood Security

The project objective of flood control has been achieved with a beneficial impact on the level, timing, duration and extent of flooding, but at the expense of increased waterlogging in some project areas. In fact, waterlogging is a major problem in about one-third of the area located in the western part of the project. Construction of embankment, unplanned roads without bridges or culverts and lack of drainage canals may be cited as the major causes of waterlogging in the area. Reduction in the wet land and water bodies has taken place in the area with consequent negative impact on the fisheries and on surface water irrigation. Reduced river flow has caused siltation of the internal canals. According to village level survey, ground water level is also declining on the higher ground and ridges, where shallow tubewells are extensively used for both irrigation and drinking water supply. Long term monitoring of ground-water table is, therefore, necessary in the project area.

Flood control has reduced the regular deposition of new silt on the cultivable land. The growth of blue-green algae, which is mostly responsible for

the natural fertilization of land has not taken place since the initiation of the project. Decreased flooding has also resulted in a negative impact on soil moisture in high and medium lands in the project area. An effective drainage system might alleviate the problem but does not seem to exist at present.

The biological environmental impacts in terms of flora and fauna has been mixed. Insects, rats and mosquito population have increased due to more intensive crop cultivation, the increased shelter area and stagnant water bodies. Also, loss of habitat due to extensive crop cultivation has reduced the snakes and frogs in the project area which tend to disrupt the food chain and degrade the environment. Tree population, both fruit as well as commercial trees, on the other hand, have registered an increase in recent years due to more secure flood-free environment. Livestock population, particularly cattle has declined in the project area due to paucity of grazing land and also supply of animal feed. Domestic poultry population particularly chicken, on the other hand, has increased in the project area due to enhanced security from flooding, increased availability of foodgrain and other crops. Moreover, financial support from different NGOs has encouraged rural women to raise goats and chicken on a commercial basis. However, this is not a project impact.

Institutional Aspects: Coordination and Interaction

Hardly any coordination has been observed among different agencies along the lines perceived in the Appraisal Report. At present there exist no inter-agency linkage programmes. The agencies have their own programme, which they are operating quite independently in the project area without any coordinated efforts in order to fully derive the potential benefits of the project. Under the changed circumstances, the role of BADC for stipulated activities under the project is absent with no coordination with private sector initiatives in this respect. The activities of BRDB in the development of TCCA/KSS have not progressed at all. Similarly, DAE has failed to make much headway as promoter of HYV technology. DAE operates independently regardless of the location of SSISP sub-projects, and peruses its own plans and programmes in the project area without any coordination. The field survey also indicates that local people were not involved in the planning, design or even during the implementation stage. This could have offered a better scope for better design and more

effective implementation of the project. However, BWDB did not face any problem created by local people during project planning and implementation. Moreover, the field experience also shows that Baranai perhaps represent the only first-cycle sub-projects where local committee are performing reasonably well. During the operation stage, the involvement of local people is essential in order to derive the maximum benefit from the project, both in terms of efficiency and equity.

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PROJECT SUMMARY SHEET

Baranai River Sub-Project

Project Name	:	Baranai River Sub-Project		
Project Type	:	Flood Protection, Irrigation and Drainage		
Location	:	District	:	Natore, 240 Km North West from Dhaka City
Area	:	Gross Area	:	5081 ha
		Net Area	:	3834 ha
Funding Agency	:	ADB/EEC		
Implementing Agency	:	BWDB		
Construction Started	:	1982-83		
Actual Completion	:	1985-86		

THE BENGALI CALENDAR

The Bengali Calendar has been used in the socio-economic surveys for this study. This has been done because of its familiarity to the respondents and some of the tables are presented by Bengali months. The Bengali months start on the 14, 15 or 16 of the Gregorian months. The Bengali year starts on 1 Baishakh (14 April).

The equivalence of Bengali and Gregorian months are shown below.

Bengali Month	Gregorian Month
Baishakh	Mid-April to Mid-May
Jaistha	Mid-May to Mid-June
Ashar	Mid-June to Mid-July
Sravan	Mid-July to Mid-August
Bhadra	Mid-August to Mid-September
Aswin	Mid-September to Mid-October
Kartik	Mid-October to Mid-November
Aghrayan	Mid-November to Mid-December
Poush	Mid-December to Mid-January
Magh	Mid-January to Mid-February
Falgun	Mid-February to Mid-March
Chaitra	Mid-March to Mid-April

CHAPTER 1

INTRODUCTION

1.1 Background

The economy of Bangladesh is largely agrarian in character. Agricultural activity accounts for approximately 44 per cent of GDP and employs nearly 60 per cent of labour force. Within agriculture, crop production, particularly food production constitute the major activity. Rice and wheat, the major foodgrain occupy more than 80 per cent of gross cropped area in the country. Inspite of this, the level of production is not adequate to feed its growing population. In fact, one of the most pressing problems of Bangladesh is its chronic food deficit. Bangladesh has been meeting this deficit with import of foodgrains. It is, therefore, not surprising that since independence development planning have centered around strategies to increase foodgrain production in order to meet the growing requirements. In fact, attainment of self-sufficiency in foodgrain has been recognised as one of the major objectives of development planning and pursued as a major element of development policy in Bangladesh.

Bangladesh has considerable potential for foodgrain production. Much of the country consists of flat deltaic alluvial plains with soil that is generally fertile. The climate is suitable for year-round cropping and also there is generous supply of surface and ground water resources. However, production is hampered by frequent natural disasters including cyclonic storms, floods, drought and saline intrusion. Also, a variety of factors -- socio-economic, technical and institutional -- keep the production far below its potential.

Due to severe land constraint, increasing food production in Bangladesh largely depends on improvement in land productivity. In this context, the adoption of modern technology has been recognised to be the major source of growth in output and productivity in food production in the country. Since the introduction of modern technology, growth in foodgrain output has been largely determined by reallocation of land from traditional to modern varieties. Further diffusion of technology holds the key to future growth potential of foodgrain

production; but this need to be achieved without sacrificing the environmental basis of sustainability.

1.2 The Small Scale Irrigation Sector Project (SSISP)

The Small Scale Irrigation Sector Project (SSISP) was conceived and designed within the Medium Term Foodgrain Production Plan (MTFPP) under the Second Five Year Plan (1980-85) of Bangladesh. The MTFPP was prepared as a detailed sub-sectoral plan and implementation programme for the development of agriculture, water and other rural infrastructures required for foodgrain self-sufficiency. One important component of the plan was an investment portfolio for provision of water control and irrigation consisting largely of short-gestation, high-priority and divisible projects ready for immediate appraisal and implementation. The central thrust of these projects was the provision of additional irrigation, drainage and flood control facilities to effectively improve the food production environment and to reduce vulnerability of crop production prospects due to unpredictable rainfall and water supply particularly floods.

Within the MTFPP, the Small Scale Irrigation Sector Project (SSISP) was designed to contribute to increased food production in the country. This was sought through implementation of small projects comprising the construction and rehabilitation of irrigation, drainage and flood protection facilities, and installation of equipments such as low-lift pumps and deep and shallow-tubewells. The sub-projects were selected in accordance with the criteria specified by the Asian Development Bank (ADB). Each of the selected sub-projects underwent detailed appraisal by the Bangladesh Water Development Board (BWDB) Project Office.

The SSISP was initially planned to encompass 31 sub-projects with various components (e.g. flood control, drainage, irrigation, protection from high tides). The sub-projects were designed in all the regions of Bangladesh with a net area of 103, 730 ha -- 69.7 per cent of which were to be brought under flood control, 48.6 per cent under irrigation and 35 per cent under drainage facilities (see Annexure 1). Moreover, there were wide variations in size (i.e. net project area), proposed irrigation modes (utilization of ground water and/or surface water) and involvement of public agencies in Command Area Development (i.e. BADC and

national programmes). The sub-projects were also planned to be implemented in phases, broadly in four cycles.

The construction of the first cycle of sub-projects (four in number) commenced in 1982/83 and the remaining cycles followed in phases. The Bangladesh Water Development Board (BWDB) was responsible for the identification, appraisal, design and construction of the civil works for the sub-projects. The Bangladesh Agricultural Development Corporation (BADC) was also made responsible for supervising Command Area Development (CAD). However, the procurement of minor irrigation equipments for SSISP was taken out of the Project Proforma (PP) component for BADC early in the project indicating virtually no role of BADC in these respects. Apparently, the CAD aspects of SSISP were to be considered under the national programme. The SSISP was expected to provide BADC with detailed planning map of each sub-project for organization and monitoring of irrigation facilities under the national programme. In two sub-projects, BADC remained interested in CAD for deep tubewells for which it procured equipments under EEC grant. The project also envisaged that the Bangladesh Rural Development Board (BRDB) and the Department of Agricultural Extension (DAE) would actively participate in the on-farm infrastructural, institutional and extension work as cooperating agencies of the project.

The SSISP was financed by ADB loans, EEC grant and local counterpart funding by the government (GOB).

1.3 Objectives and Scope of the Evaluation Study

As mentioned earlier, the SSISP involves a number of sub-projects, that are regionally dispersed. More importantly, there are variations across these sub-projects in terms of infrastructures related to water management. However, two common elements of the sub-projects are worth mentioning: (i) the sub-projects are relatively small in terms of area covered (from 316 ha to 8097 ha); and (ii) they aim to contribute to increased foodgrain production through increased irrigation coverage and/or changes in water regimes.

Recognizing these commonalities, the major objectives of the evaluation study on SSISP are two-fold:

(a) Assess the socio-economic (including agricultural) impacts of the Project; and

(b) Identify lessons for future designing and implementation of small scale irrigation projects in Bangladesh.

Under the first objective, attempts have been made to identify the socio-economic impacts of a sample of sub-projects. The primary aim of the study is to identify the constraining factors on expected impacts of the sub-projects and also to capture attitude, expectations, experiences and opinions of the population in the project areas. Within the scope of the second objective. the major emphasis has been to capture the specificities of the individual sub-projects in order to reach general conclusions on problems related to small scale irrigation in Bangladesh and assist in formulating strategies for improved planning and implementation of similar projects in the future.

The flow of benefits from SSISP has been perceived primarily in terms of increases in foodgrain production. This is expected to be realized by bringing in more land under crop cultivation, crop substitution in favour of more remunerative crops, and increase in crop yields due to adoption of modern varieties and inputs. The evaluation study, therefore, examines the changes resulting from the project in agronomic practices, soil status, cropping patterns, farm labour demand along with cumulative impact of these changes on overall income and employment in the project area. The projects, involving flood control and drainage, are also expected to reduce the vulnerability of human lives, livestock and plant species and damages to crops and infrastructures. Such impacts may also have potential positive effects on health and habitation. Besides these aspects, the study intends to evaluate the impacts of the project on non-crop agriculture and non-agricultural activities. Among various social aspects, the impacts on family structure, education, health, and status of women are important areas for evaluation.

It is expected that the performances of participating agencies, particularly of BWDB, will have important bearing on the realization of expected impacts of the project. While detailed engineering aspects of the BWDB activities are beyond the

scope of the present evaluation, certain technical matters such as appropriateness of structures and their sites, adequacy of works done, operation and maintenance (O&M) etc. are examined in relation to their implications for flow of project benefits.

Another important area addressed in the evaluation study is the way irrigation schemes are being operationalized in the project area once the basic infrastructures are provided. This calls for examination of the nature and extent of local level participation in maintenance, supply of modern inputs, and dissemination of information on seed and technology. In this regard, the activities of BADC, BRDB and DAE are studied along with identification of private responses.

It needs to be emphasized here that this study will mainly rely on village level and household level survey for generating the necessary information for socio-economic evaluation of the projects selected for our study. Given the limited time and scope, no attempt has been made for full project impact evaluation and hence the study can not provide a detailed and rigorous benefit cost analysis. However, as mentioned earlier, this study will attempt to capture through close examination of appropriate indicators whether the selected projects have a net positive impact on socio-economic conditions of the villagers and whether the associated changes in social and economic life of the people are likely to be conducive to overall development prospects in the project areas.

1.4 Methodology of Study and Sources of Data

As noted earlier, the sub-projects of SSISP are regionally dispersed and vary in terms of components involved (i.e. flood control, drainage, irrigation, protection from high tide), size (net project area), irrigation modes practised, involvement of public agencies in CAD (i.e. BADC and national programme) and other characteristics. Moreover, the sub-projects have been implemented at different times (broadly grouped into four cycles) and a number of them discontinued later on. While it may have been desirable to evaluate each of the sub-projects under SSISP to capture all specificities, it is not considered cost effective both in terms of finance and time. The methodology, therefore, involved a selected number of representative sub-projects for detailed study.

1.5 Project Description and Objectives

The present Report presents the findings of the socio-economic evaluation for the Baranai River sub-project under the SSISP. The SSISP, as mentioned earlier, consist of 31 sub-projects planned to be implemented in four phases. The Baranai River sub-project belong to first cycle sub-projects under SSISP, which were planned and implemented in the early 1980's. The physical works of Baranai commenced in 1982/83 and completed in 1985/86.

The project is located adjacent to the Baranai River at Naldanga near Natore in Rajshahi district (old). It is adjacent to and north-west of Chalan beel Polder B. The project covers an area of 5080 hectares. The objectives of the project are to provide protection against the monsoon flood, improve the interior drainage system and provide irrigation to most of the project area. The resulting project benefit will be mainly derived from expansion of HYV paddy in Aus, Aman and Boro season. Such improvement in cropping pattern is expected to be achieved with protection against early flooding and more importantly, from reduction in the depth and duration of standing water during the monsoon through construction of a full flood embankment along the Baranai river. The irrigation would be provided through utilization of water as much as possible in the Baranai River using low lift pumps, and exploitation of ground water resources in the area using shallow and deep tubewells.

CHAPTER 2

METHODOLOGY AND SOURCES OF DATA

The evaluation of Baranai sub-project is based on information collected through a combination of different techniques. The main features of the methodology of information collected for evaluation of this project are briefly summarised below.

2.1 The Selection of Baranai Sub-project

This study selected 10 out of 31 sub-projects of SSISP for socio-economic evaluation. The selection procedure is based on a priori information from project completion reports, particularly the Consultancy Completion Report (July, 1990) of SSISP project. According to the Report, out of total 31 sub-projects, 7 were discontinued and 15 completed and the rest were under implementation. Table 2.1 provides a list of all projects and their status (as of 1991).[1] The projects were grouped according to their location, size and component involvement. Ten sub-projects were then selected for detailed evaluation keeping in view the following criteria so that they represent all types of sub-projects.

(a) At least one sub-project is selected from each of the five broad regions (regional classification is provided in Table 2.2) over which the sub-projects are dispersed.

(b) From each region, at least one sub-project is chosen from each type of sub-projects grouped in terms of similarities in components.

(c) From each region, at least one sub-project is chosen from each class of sub-projects grouped according to size (i.e. net area). Sub-projects with net area greater than 4000 ha have been considered here to be large and those with net area less than or equal to 4000 ha have been treated as small.

(d) Selected projects completed preferably in earlier periods or cycles were chosen in order to facilitate proper assessment of the impacts.

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[1] The changes in the status of these sub-projects during the period of this study is listed in the footnote of Table 2.1.

Table 2.1

Summary Characteristics of Sub-Projects of SSISP

Serial Number & Cycle		Name of the Sub-project or Scheme	From Dhaka		Objectives	Area (ha)				
			Direction[2]	Miles		Status[1] of the Project	Gross 00.000	Net 33,333	Flood control 00,000	Irrigation	Drainage
1	01	Baranai River Sub-Project	N60W	150	D/FC/I	c	5,080	3,811	2,430	1,251	810
	02	Barkati Beel Sub-Project	N39W	40	I/FC	c	445	365	365	-	122
	03	Hanger Khal Irrigation Scheme	S45E	170	I	c	765	367	-	367	-
	04	Pakuria Beel Sub-Project	W	90	D	c	2,590	2,228	-	-	2,228
			Cycle 1 Totals:				8,880	6,771	2,795	1,618	3,160
2	05	Haijda Embankment Project	N20E	115	FC/I	c	9,717	8,097	5,830	3,240	810
	06	Tirnai River Sub-Project	N30Z	290	I	c	328	316	-	316	316
	07	Kanchandi River Sub-Project	N30W	280	I/D	c	380	364	-	364	364
	08	Versa River Sub-Project	N30W	265	I	c	433	417	-	417	417
	09	Tangon Sub-Project	N35W	260	I	o	4,632	4,454	-	4,453	4,453
	10	Tulshia Beel Sub-Project	N30W	275	I	c	202	202	-	202	-
	11	Nathabhanga-Upper Bhairab	S80W	130	I	a	Feasibility Study Only				
			Cycle 2 Totals:				15,692	13,850	5,830	8,992	6,360
3	12	Aglar Chak Irrigation Project	S80W	20	FC/I	c	7,935	4,656	2,996	2,632	405
	13	Keraniganj Irrigation Project	S60W	8	FC/I	o	10,931	6,883	4,453	3,240	810
	14	Boalkhali Irrigation Project	S45E	150	I or FC/I	o	12,550	7,287	4,858	4,858	3,644
	15	Balali Padamaree Irrig. Project	N20E	105	FC/I	o	2,389	2,024	1,620	405	-
	16	Gagrajola Irrigation Project	S85E	30	FC/I	o	8,705	4,656	3,240	4,292	-
	17	Sachar Bazar Irrigation Project	S80E	32	FC/I or I	a	Feasibility Study Only				
	18	Gurnar Haor Irrigation Project	N30E	140	FC/I	c	7,247	5,263	4,858	4,312	810
	19	Sonamoral Haor	N32E	132	FC/I	c	3,725	3,158	2,429	1,620	405
			Cycle 3 Totals:				59,150	33,927	24,454	21,359	6,074

Table 2.1 Contd.

Serial Number & Cycle	Name of the Sub-project or Scheme	From Dhaka		Objectives	Area (ha)				
		Direction[2]	Miles		Status of the Project	Gross 00,000	Net 33,333	Flood control 00,000	Irrigation	Drainage
4 20	Baisari-Saidkhati Sub-Project			FC/I	a	5,223	Feasibility Study only			
21	Patuakhali Polder 43/2B (S.P.)			FC/I	c	5,466	5,247	5,247	3,036	2,024
22	Patuakhali Polder 55/2C (S.P.)			FC/I	c	6,275	6,024	3,563	2,429	
23	Tarail Pachuria Polder-2 (S.P.)			FC/I	o	8,300	5,810	5,810	2,753	1,619
24	Madhukhali-Baliakandi Irr. Proj.			D/FC/I	o	9,448	8,048	6,480	1,000	1,000
25	Patuakhali Polder 55/3			FC	o	9,845	7,403	7,403	-	7,403
26	Patuakhali Polder 55/4			FC	c	5,142	4,288	4,288	-	4,288
27	Kamarnogaon F.C.D. Project			D/FC	c	5,652	4,409	4,000	-	2,000
28	Pangsa Irrigation Project			I	o	32,400	8,097	-	8,097	-
29	Makash Beel Development Scheme			D	a	2,753	Feasibility & Design Only			
30	Munshiganj-Tongibari			FC/I	a	-	Preliminary Study Only			
31	Updakhali			FC/D/I	a	8,500	Feasibility & Design Only			
		Cycle 4 Totals:				99,004	49,326	36,791	17,315	16,334
D-Drainage, FC-Flood Control, I-Irrigation		Project Totals :				182,726	103,874	69,870	49,284	33,928

Note : [1]Status of the project: c = completed
o = ongoing
a = abandoned

Since the undertaking of this status in March 1992, four ongoing sub-projects (e.g. Haijda Embankment, Keraniganj Irrigation, Gugrajala Irrigation and Pangsa Irrigation Project) have been completed and thus the number of completed projects has gone up from 15 to 19. At the time of undertaking of the study, Boalkhali Irrigation Sub-project was an ongoing one which has recently been discontinued so as to increase the number of discontinued sub-projects from 6 to 7.

[2]This information for projects 20 to 31 were not included in the sources noted below.

Source: Consultancy Completion Report (1990) and BWDB Report (1991).

Table 2.2

Distribution of Completed Projects by Region, Type and Size

Region		Project type	Size of the project	
			Large	Small
I	Rajshahi	A=D/FC or D	-	[01]
	Kushtia	B=D/FC/I or FC/I	-	-
	Dinajpur	C=I or D/I	-	06,07,[08],10
II	Faridpur	A	[27]	[04]
	Dhaka-Tangail	B	[12]	[02]
	Comilla	C	-	-
III	Mymensingh	A	-	-
	Sylhet	B	[18]	19
		C	-	-
IV	Barisal	A	-	-
	Patuakhali	B	[21],[22],26	-
		C	-	-
V	Chittagong	A	-	-
		B	-	-
		C	-	[03]

Note: All the figures indicate serial numbers of the sub-projects used by BWDB. Figures in brackets indicate the serial number of sub-projects selected for this study.
D = Drainage, FC = Flood Control, I = Irrigation.

Source: BWDB Report (1991)

In order to satisfy the above criteria for selection of sub-projects for evaluation, the distribution of 15 completed sub-projects (shown in Table 2.3) may be considered. The sub-projects, Baranai, Barkati, Pakuria Beel, Aglar Chak and Kamarnogaon (Nos. 1,2,4,12 and 27 respectively) do not have competitors to satisfy the above criteria. Therefore, they have been selected for detailed evaluation. Among Tirnai, Ramchandi, Versa and Tulshia (Nos. 6,7,8 and 10) of type C of small size in Region I, two sub-projects could be selected. Considering the recent evaluation of Ramchandi sub-project by BWDB and the small size of both Tirnai

Table 2.3

Basic Information of Completed and Selected Sub-projects

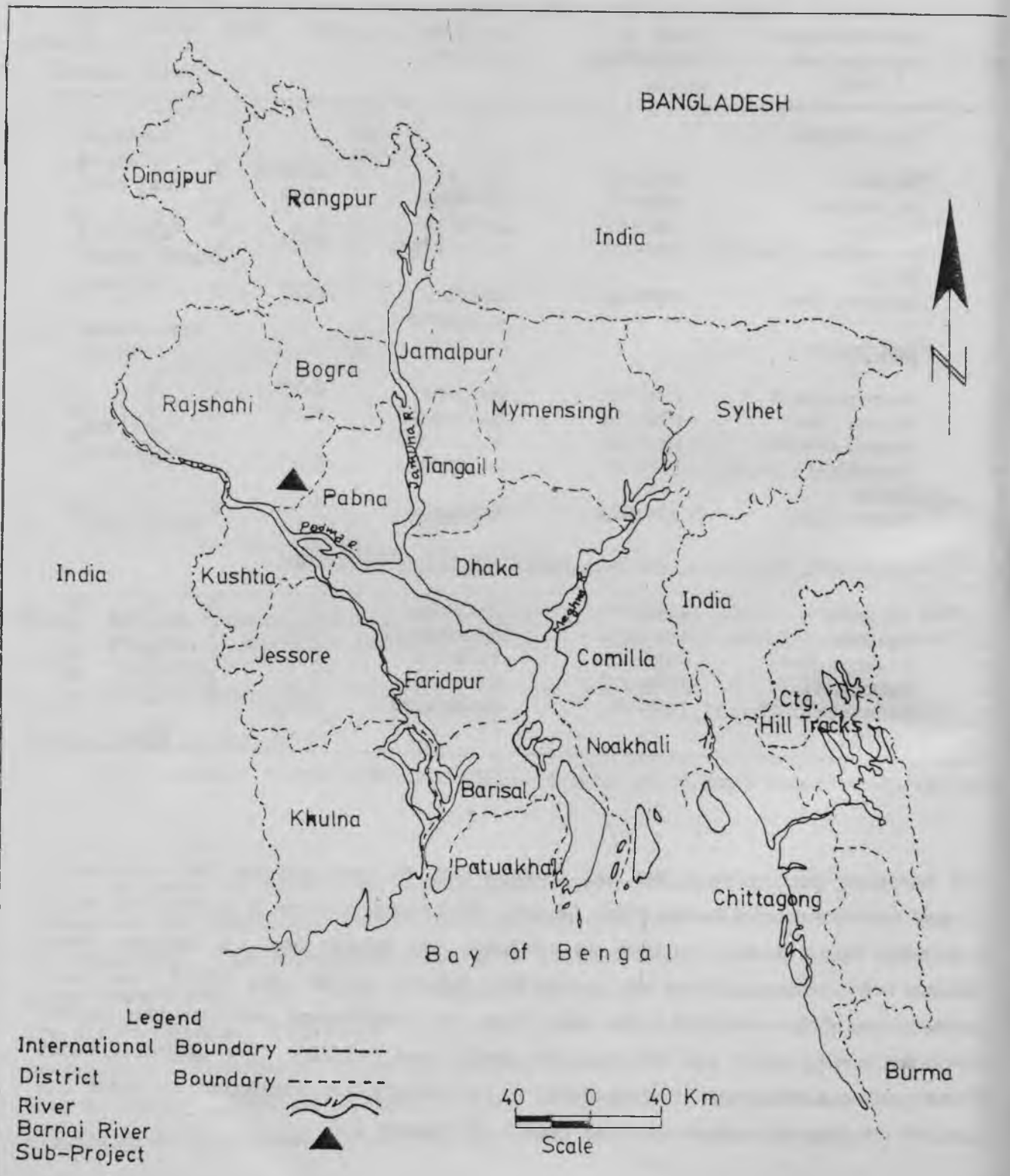
Sl. no.	Name of the sub-project	Year of completion	Location upazila	Type	Size	Project No.	
						Cycle	Serial
A.	1st phases						
1.	Barnai	1985-86	Natore	D/FC/I	S	1	01
2.	Aglarchak	1990-91	Nawabganj	FC/I	L	3	12
3.	Varsha	1986-87	Tetulia	I	S	2	08
4.	Patuakhali Poldar 55/2C	1989-90	Galachipa	FC/I	L	4	22
5.	Barkati Beel	1985-86	Basail/ Mirzapur	FC/I	S	1	02
B.	2nd phase						
6.	Kamarnaogaon	1985-86	Delduar	D/FC	L	4	27
7.	Gurmar Haor	1990-91	Sunamganj	FC/I	L	3	18
8.	Pukuria Beel	1985-86	Balaikandi	D	S	1	04
9.	Patuakhali Poldar 43/2B	1990-91	Galachipa	FC/I	L	4	21
10.	Hangor Khal	1985-86	Satkania	I	S	1	03
C.	Completed Projects, but not selected for evaluation						
11.	Tirnai	1986-87	Tetulia	I	S	2	06
12.	Sonamoral Haor	1990-91	Sunamganj	FC/I	S	3	19
13.	Tulshia Beel	1985-86	Tetulia	I	S	2	10
14.	Ramchandi	1986-87	Tetulia	I	S	2	07
15.	Patuakhali Poldar 55/4	1990-91	Galachipa	FC/I	L	4	26

Source: Consultancy Completion Report (1990) and BWDB Report (1991).

(316 ha) and Tulshia Beel 202 ha), Versha (No. 8) was selected for evaluation. Gurmar and Sonamoral haors (Nos. 18 and 19) belong to type B (D/FC/I or FC/I) in Region III. It was decided to evaluate the larger one i.e. Gurmar haor. Amongst the three polders in Patuakhali (55/2C, 43/2B and 55/4), two sub-projects could be selected. In this case, the preference was for the earlier completed sub-project (55/2C) and the larger one (43/2B). The characteristics of the projects selected for evaluation in this study are presented in Table 2.3. Location of Baranai sub-project is shown in Figure 2.1.

Fig. 2.1

PROJECT LOCATION MAP: BARANAI RIVER SUB-PROJECT



2.2 Methodology for Data Collection

This evaluation study is based mostly on primary data collected through field surveys both at the village and household levels. However, secondary information have also been used from project feasibility and other BWDB reports, which mainly provided information on the pre-project situation, project design and project objectives.

Data collection for this study, as mentioned earlier, involved combination of different techniques. Most of the data used in the study was collected through administering questionnaires among the sampled households in the field survey. Information was collected on different aspects of household production activities, income, expenditure, assets and employment. Information were also elicited regarding the impact of project on prevention of flood damage, drainage congestion, expansion of irrigation practices etc. Information on the household questionnaire was obtained by interviewing the head of the household. Household questionnaire was also used to collect information on the situation of women and the situation of the household in terms of access to water for domestic uses and access to fuel. Since these issues largely concern the women members of the households, the questions were addressed to the female member who was considered most important within that household.

In view of limited spatial coverage of household survey as these were confined to three project villages, it was apprehended that some essential elements of the project may not be captured through this survey. To guard against such an eventuality, village level information on project impact was collected, using village level questionnaire. This not only extended the coverage of project impact to more area, but, more importantly, collected information on certain aspects not relevant to a household but to a village (e.g. operation of project implemented committee, flood damage village infrastructure etc.). Village level questionnaire was filled in through a discussion meeting with a group of informed persons (e.g. school teacher, educated old persons, religious leaders etc). Important occupational groups such as traders, wage workers etc was also well represented in the group of persons interviewed.

Beside the questionnaire surveys, information were also collected through case studies, interviews as well as direct observations through field visits. in particular, the questionnaire survey was complemented by specialists' study on relevant aspects of the project. These specialists included sociologist; agronomist and irrigation engineer. The methodology of their data collection is discussed in Section 2.5.

2.3 Selection of Villages for Sample Survey

As mentioned earlier, in order to collect information at the community level, the technique of village level survey was used. This survey was conducted in 17 villages in the project area. The selected villages grouped on the basis of benefits accruing to the farmers are shown in Table 2.4. Also, "control" village was selected in order to capture all possible impacts due to project intervention. This village was selected in such way that it was situated near the project but was not affected in any way either by the project itself or by any other neighbouring project. Moreover, the scope of choosing of crop cultivation pattern in the selected control village had to be similar to that of the project villages. In other words, the situation of the control village in terms of land level, flood depths and duration was comparable to the pre-project situation in the project area.

Table 2.4

Distribution of Villages for Village Level Survey in Baranai River Sub-Project

Groups	No. of Villages	No. of Households
A	4	1180
B	5	1037
C	8	1561
D	1	135
Total	18	3913

Note : A = Most Benefitted, B = Moderately Benefitted
C = Least Benefitted, D = Control

Source: BIDS/SSISP Field Survey.

Key informant system (KIS) was adopted to collect information from these selected villages. It was expected that the information thus collected could be consistently integrated with the data collected at the household level from the more intensively surveyed project villages vis-a-vis the control village. From seventeen project villages, three villages, namely Paschim Haguria, Churamanbati and Bhasbhage was selected for conducting household level survey in such a manner that the selected villages were representative of the whole project area.

2.4 Selection of Households for Sample Survey

For selection of sample households required for conducting household level surveys, a census of village households was conducted to collected information on landownership and broad occupational category (agriculture vs non-agriculture). The households were then stratified into four ownership groups -- landless (no cultivable land), small (0.01-1.01 ha), medium (1.02-2.02 ha) and large (2.03 ha and above) and two occupational category within each landownership group.

Stratified random sampling method was used, with village as the primary unit and household as the ultimate unit. Random Number Table was used to draw samples based on two-way classification according to farm size and main occupation of the household. The sample was designed to maintain the equal proportionate ratio of the sample households to the total households in each cell representing strata as defined above. The proportionate ratio was determined at 0.08 of the total households -- the number being approximately 24 households from each village surveyed. Thus, in total about 100 households were chosen from 4 villages - 3 project and one control village-surveyed. As can be observed from Table 2.5, some discrepancy between the ex-ante and ex-post samples emerged. These discrepancies, though insignificant, might have been due to deviations of information collected by the key informants from those from the households themselves.

The detailed impact evaluations were carried out with formal questionnaires administered to the sample households in both project and control villages. Two sets of questionnaires were utilized - one for the main household survey, and the other focussing particularly on women administered by Female Field Officers. The

information was supplemented with Field Reports by Supervisors and other Field Officers.

Table 2.5

Household Sample Selection Process in Baranai

Farm Size Group (ha)	Number of Households					
	Project Village			Control Village		
	Total	Ex-ante sample	Ex-post sample	Total	Ex-ante sample	Ex-post sample
Landless (0)	305	36	36	26	5	5
Small (0.01-1.01)	258	33	33	81	14	15
Medium (1.02-2.02)	53	9	5	19	3	3
Large (2.03 and above)	26	3	-	9	2	2
All Farms	642	81	81 (12.62)	135	24	25 (18.52)

Note : Figures in parenthesis are percentages of ex-post sample in total households

Source: BIDS/SSISP Field Survey.

It may be mentioned here that for some category of households, it was not possible to compile satisfactory sample frame for probability sampling. These groups included non-crop households e.g. fisherman, traders, artisans, transport workers, and non-agricultural households. Therefore, in both the project and control villages, they were interviewed separately wherever possible to illustrate the project impacts on non-crop activities.

2.5 Specialists' Study

The village and household level surveys were further complemented with study of the project impacts through case studies and observations by various specialists such as irrigation-engineer, agronomist and sociologist. These specialists made a number of field visits, conducted interviews with staff and officials of relevant govt. departments and used relevant structured questionnaires as well as secondary and other available sources. These provided relevant information in evaluating the effectiveness of project structures, their operation and maintenance, in exploring the institutional relationship regarding project related activities and also in analysing the agronomic and environmental aspects of the project intervention.

CHAPTER 3

PHYSICAL STRUCTURES: ENGINEERING DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE

3.1 Pre-Project Situation

The topography of the project area is generally flat with elevation ranging from +34.00 RL to +46.00 RL. Historically, the project was subject to annual flooding during the monsoon season. Also, inadequate drainage during the months of October and November, particularly in the north-west part caused problem of waterlogging in the area. Floodwater from the river used to overspill the bank almost every year thereby casing damage to aus, aman and jute in their early stages. As a result, average yields of these crops suffered heavily. Also, the depth and duration of the flood prevented any significant shift from local variety to HYV, particularly in the Aman season. in fact, the cropping pattern was dominated by local Aman (50% of net cropped area) and local Aus (30% of net cropped area) in the pre-project situation. Alongside this traditional agriculture, only a limited area was devoted to the cultivation of HYV Boro with irrigation through LLPs and STWs. However, considerable land was devoted to the cultivation of HYV wheat, which claimed about one-fourth of net cropped area before the implementation of the project.

3.2 Project Objectives

The project objectives were to provide protection against the monsoon flood, improve the interior drainage system and provide irrigation facilities with a view to increase agricultural production. The improvement in the cropping pattern is to be achieved with protection against (early) flooding and reduction in the depth of standing water during the monsoon. This is supposed to be attained by the construction of a full flood embankment along the Baranai river. The irrigation is to utilise as much as possible water in the Baranai through the operation of low lift pumps. The rest of irrigation is to be provided through grownd water using shallow and deep tubewells.

3.3 Project Structures

The major design features of the project are presented below in Table 3.1. The main features of the project are embankment with closures, regulators and drainage channels. The location of the embankment. regulators and drainage channels are shown in Figure 3.1. The main project structures and their present condition are indicated in Table 3.2.

Table 3.1

Summary of Design Features

(a)	Embankment (Full Flood Protection)		
	Crest Elevation	:	14.6 meter (48 feet)
	Free Board	:	9 meter (3 feet)
	Maximum Water Level	:	14.5 meter (47.7 feet)
	Return Period	:	1/100
(b)	Closures	:	2 nos.
(c)	Regulators	:	4 nos.
(d)	Drainage Channel Excavation	:	19 km.

3.3.1 Embankment

The project has a full flood protection embankment. The total length of the embankment constructed is 8 miles as compared to the 8.6 miles originally envisaged originally in the Project Proforma and the feasibility study. The embankment is located on the left bank or north side of the Baranai river. The height of the embankment along with adjusted 3 feet free board was selected based on 100 - year flood event. The embankment was constructed having a crest elevation of 48 ft. PWD with side slope 1:3 on the river side and 1:2 on the country side. It may be emphasized here that although the project embankment was constructed as per design specifications, the railline embankment need to be strengthened to the same elevation and the existing Natore - Bogra embankment should be widened, and raised from its current 46 ft PWD elevation to 48 ft. PWD elevation.

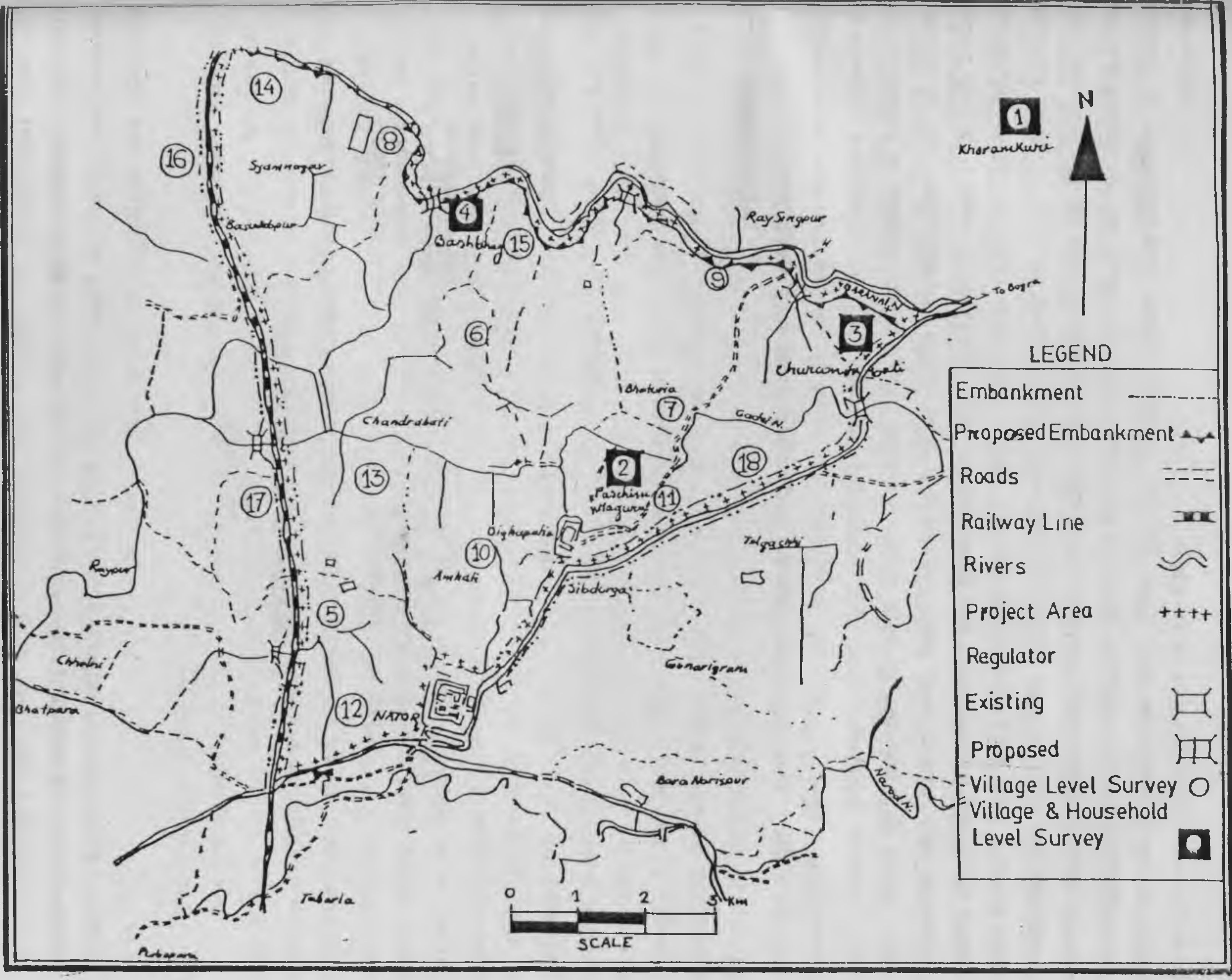


FIG. 3.1

SSISP: BARANAI RIVER SUB-PROJECT MAP

FIG. 3.1 BARANAI RIVER SUB-PROJECT MAP

No. of the Villages	Name of the Villages
1.	Kharam Kuri (Household)
2.	West Haghoria (Household)
3.	Churamon Bati (Household)
4.	Basbhagh (Household)
5.	Brisnopur
6.	Tagorea Lakhikol
7.	Vaturia Lakhikol
8.	Durgapur
9.	Kaliganj
10.	Salimpur
11.	East Haghoria
12.	Chowdhury Barghacha
13.	Shampur
14.	Madovpur
15.	Hapania
16.	Noapara
17.	Biprobel Ghoria
18.	Teghachi

The overall condition of the embankment is good although it is subjected to public cut, rain cut. breach. erosion and rat holes. Except the public cuts, others are not as serious. The route of the entire embankment did not follow the river bank. As a result, people living in between the river bank and the embankment are exposed to the hazards of flood. The public, therefore, cut the embankment for their own safety and security causing flood in the project area. Also, the project had experienced flood several times in the past due to the breach of the embankment at several places, where the embankment followed the river bank. At these places, the river water exerts a high pressure on the embankment causing severe erosion and scouring. However, the embankment was never overtopped by the flood water after its completion.

3.3.2 Drainage Channels

An excavation of 19 km (11.82 miles) of drainage channels has been accomplished as per design specification. However. the drainage channels are now partly silted up, and. therefore, need re-exacavation for proper functioning.

3.3.3 Regulators

Four regulators each having single vent with vertical gate have been constructed on the embankment. The wing walls and the boxes of the regulators are in good condition. However, the loose aprons are partly damaged in all the regulators. The steel gates are in good operating conditons. But all the gates were found to be leaking profusely as their rubber seal have been torn or washed away during operation of the gates. The gate operating arrangements were observed to be generally good.

3.4 Hydrological Impacts

The direct impact of the project can be conceived in terms of hydrological changes which is primarily reflected in pre- and post-project flood conditions. In fact, the intended objective of project intervention by way of reduced depth and duration of flood seem to have been largely achieved. As shown in Table 3.3. the percentage of cultivated land inundated for more than four months is much lower (almost half) in the Project area as compared to the control area. However. drainage congestion in some part of the project area (the areas under Bhasbhag

Table 3.2

Main Project Structures and Their Present Conditions

Type of Structure	Present Condition of Structures									Present Condition of Pull Flood Protection Embankment with closure	Present Condition of Drainage channels
	Regulator/Sluice							Gate			
	No. of Vents	Type of Gate	Wing Wall		Box	Apron		Gate	Rubber Seal/ Groove		
			C/S	R/S		C/S	R/S				
Baromajhram Regulator	1	VL	G	G	G	G	G	G	To be provided	Total Length (Target)=8.6 miles	Total Length (Target)=19 km
Muchipara Regulator	1	VL	G	G	G	G	G	G	"	Actual Length = 8.0 miles	Actual Length = 19 km
Bashbhag Regulator	1	VL	G	G	G	G	G	G	"	Top Width = 14 ft Side Slopes: C/S : 1:2 R/S : 1:3	Needs reexcavation
Madhabpur Regulator	1	VL	G	G	G	G	G	G	"	Needs Repair and Maintenance	

Note: C/S : Country Side;
R/S : River Side;
VL : Vertical Lift;
G : Good;

Source: BIDS/SSISP Survey.

Table 3.3

Distribution of Cultivable Land by Period of Water Logging

Land Type	Village Type	Percentage of total cultivable land inundated for						
		0 month	0-1 month	1-3 month	4-6 month	7-9 month	10-12 month	Total
High land	Project :	8.3	-	-	-	-	-	8.3
	Control :	-	-	-	-	-	-	-
Medium High land	Project :	-	9.0	16.2	-	-	-	25.2
	Control :	-	6.7	-	-	-	-	6.7
Medium Low land	Project :	-	2.5	23.7	9.2	-	-	35.5
	Control :	-	-	40.0	-	-	-	40.0
Low land	Project :	-	-	9.5	19.6	2.0	-	31.1
	Control :	-	-	-	53.3	-	-	53.3
Total land	Project :	8.3	11.5	49.4	28.8	2.0	-	100.0 (5224.0)
	Control :	-	6.7	40.0	53.3	-	-	100.0 (225.0)

Note : Figures in parentheses are total cultivable land (in hectares).
Source: BIDS/SSISP Village Level Survey (1992).

regulator. which is constructed on the Hoja river) tend to limit the hydrological impact.

The perception of villagers regarding the flow of benefits from the project structures is captured in Table 3.4. It is readily observed that the most of villages surveyed derive significant benefits from both flood embankment as well as from drainage canals and regulators. although the respondents from a few villages expressed dissatisfaction about the condition of the latter.

Table 3.4

Villagers Opinion Regarding Benefits Accruing from the Project

Type of structure/ Facility	Percentage of Villages Receiving				Percentage of village without any structures
	No benefit	Marginal benefit	Moderate benefit	Maximum benefit	
1. Flood control embankment	0	0	41.2	58.8	0
2. Drainage canals and regulators	5.9	5.9	35.3	52.9	0
3. Irrigation canal	0	0	0	0	100
4. Salinity control	0	0	0	0	100

Source: BIDS/SSISP Village Level Survey (1992).

3.5 Organization and Management of the Project

The institutional arrangement for the operation and maintenance of the project including agricultural services involves four participating organizations, namely, Bangladesh Water Development Board (BWDB), Bangladesh Agricultural Development Corporation (BADC), Bangladesh Rural Development Board (BRDB) and Directorate of Agricultural Extension (DAE). During the implementation of the project, BWDB was responsible for planning, design and construction of all project structures. BADC was supposed to assume responsibility for procurement, installation and subsequent maintenance of minor irrigation equipment such as LLPs and STWs. BRDB role was confined to formation of farmers' cooperatives (KSS), provide training of cooperative members, and also disbursement of agricultural credit. Finally, the DAE was responsible for demonstration and promotion of modern technologies in the Project area through motivation and training of farmers. The Organogram of the Barnai project is provided in Fig. 3.2. The Superintending Engineer, O&M Circle, Rajshahi was responsible for supervision and co-ordination of activities of all the four agencies involved. Other project officials responsible for O&M and related activities included, among

others. Executive Engineer (O&M, Natore) of BWDB. an Executive Engineer of BADC. Deputy Director of BRDB and a Deputy Director of DAE. However. discussion with the project officials reveal that the participation and activities of other organizations except BWDB have been virtually nil. An extension overseer of the Land and Water use Directorate of DWDB takes care of the agricultural extension activities of the project.

3.6 Present Operation and Maintenance of the Project

Generally. the operation of a flood control, drainage and irrigation project demands the protection of the project area from flood. timely drain out of excess rain water from inside the project as well as timely delivery of irrigation water required to meet the crop water demand. Flood protection and drainage and supplementary irrigation during monsoon have been accomplished by constructing protective embankment with closures around the project and regulators at various points on the embankment along the Baranai river. Excess rain water was drained out from the project by opening the regulator gates based on the level of water inside and outside the project. Water can be entered into the project through the regulator gates if drought prevails and the same can be used for irrigation purpose.

Some important aspects of operation and maintenance and issues related to management of Baranai River Sub-project are described below.

3.6.1 Operation of Regulator

The BWDB authority reported that the decisions concerning operation of the gates (opening and closing) were taken by the Regulator Committee through participation of beneficiaries. The gate Khalashi appointed by the project authority opened and closed the gate on request of the farmers. The regulators as observed during field visit were easily operable. This was confirmed by the BWDB authority and the beneficiaries interviewed.

3.6.2 Maintenance of Regulator, Embankment and Drainage Canal

All maintenance works of the engineering features have been carried out by Bangladesh Water Development Board. Need for maintenance works was assessed through inspection, survey or by observing the unsatisfactory

performance of the structures. The officials reported that petty repairing was done to flush sluice and the gates were painted and greased for smooth functioning as and when necessary. There were leakages through the gates. In order to stop the leakage, the sides and bottom of the gates should be sealed by rubber which is usually washed away due to high pressure exerted by the water during opening and closing of the gates. For instance, at Baromajgram and Muchipara there are provisions of installing gates at two sides of the regulators. But only one gate has been installed for which there is leakage of water. Discussion with BWDB authority indicated that the embankment and closures so far were repaired thoroughly only once. Sometimes they were repaired under Food for Works (FFW) Programme. Some maintenance works such as reexcavation or deepening of main canal and drainage canal, remodelling and resectioning of embankments and repairing of embankments and closures were done during the previous years. These should be done annually. Turfing was also observed during the field visit. Field canals were maintained by the beneficiaries themselves.

The maintenance works are primrily dependent on the availability of fund and staff. The officials complained that lack of funds and facilities resulted in unsatisfactory maintenance works. All the beneficiaries, on the other hand, complained that maintenance works were hampered for not taking timely steps by the concerned persons. In order to perform the maintenance works sufficient number of tools, equipment and/or materials should be stocked in the store and made available to the persons concerned at the time when need arises.

3.6.3 Manpower and Training

The project has required number of officials and staff as per O&M Manual. Canadian International Development Agency (CIDA) and International Development Agency (IDA) arranged training programmes before. Moreover, there are provisions for in-house and local training of the personnel involved with O&M. In 1983-84, CIDA arranged a 3-day training programme in Rajshahi where executive engineer, sub-divisional engineer and section officer received training. In addition to this, training on O&M is also given in Kaptai Engineering Academy.

3.6.4 Budget for Operation and Maintenance

The construction of the project was completed in 1989. Since then, i.e. over the last 3 years (1989 to 1992), Tk. 2.14 lakh was alloted for O&M works under 163 IND fund, but only Tk. 1.35 lakh had been spent for this purpose.

3.6.5 Transport and Vehicle

The vehicles used by the officials were not enough for smooth O&M of the project. The condition of the vehicles is not good and needs repairing. Similarly, the motor cycle used by S.O. is almost out of order. There was shortage of transport used by the field level staff.

3.7 Problem and Constraints

A number of problems have been identified both with respect to project structures as well as management of the Baranai Project. These are summarised below:

1. Drainage congestion that occurred in the areas under Bashbhag regulator which is constructed on the Hoja river. The project area under Bashbhag regulator was rather low compared to other areas.
2. Siltation in the drainage channel.
3. Breach of the embankment.
4. Lack of spare parts of LLPs and STWs.
5. No participation of the beneficiaries during planning and execution of the project.
6. Poor management of drainage and irrigation canals.
7. Inadequate and untimely funding for O&M.
8. Lack of coordination among various project officials.

3.8 Recommendations

In the light of the preceding discussion on physical features and management of Baranai project, the following recommendation are made for improved effectiveness and better functioning of the project.

(a) Measures should be taken to protect the area under Bashbhag regulator from inundation due to sudden but heavy rainfall. This can be achieved by pumping the excess water using high capacity low lift pumps (LLPs) because this water cannot be drained out by gravity flow as the water level in the Baranai river is higher than the field water level.

(b) Flood embankment should be made failure proof by earth filling, turfing, planting etc. every year. This should be considered as a routine work. Moreover, constant inspection of the structures and embankment should be made by the BWDB authority.

(c) Spare parts for LLPs and STWs should be made available to the farmers as and when necessary.

(d) Adequate fund for O&M should be made available every year.

(e) The drainage channel needs reexcavation, resectioning and realignment every year.

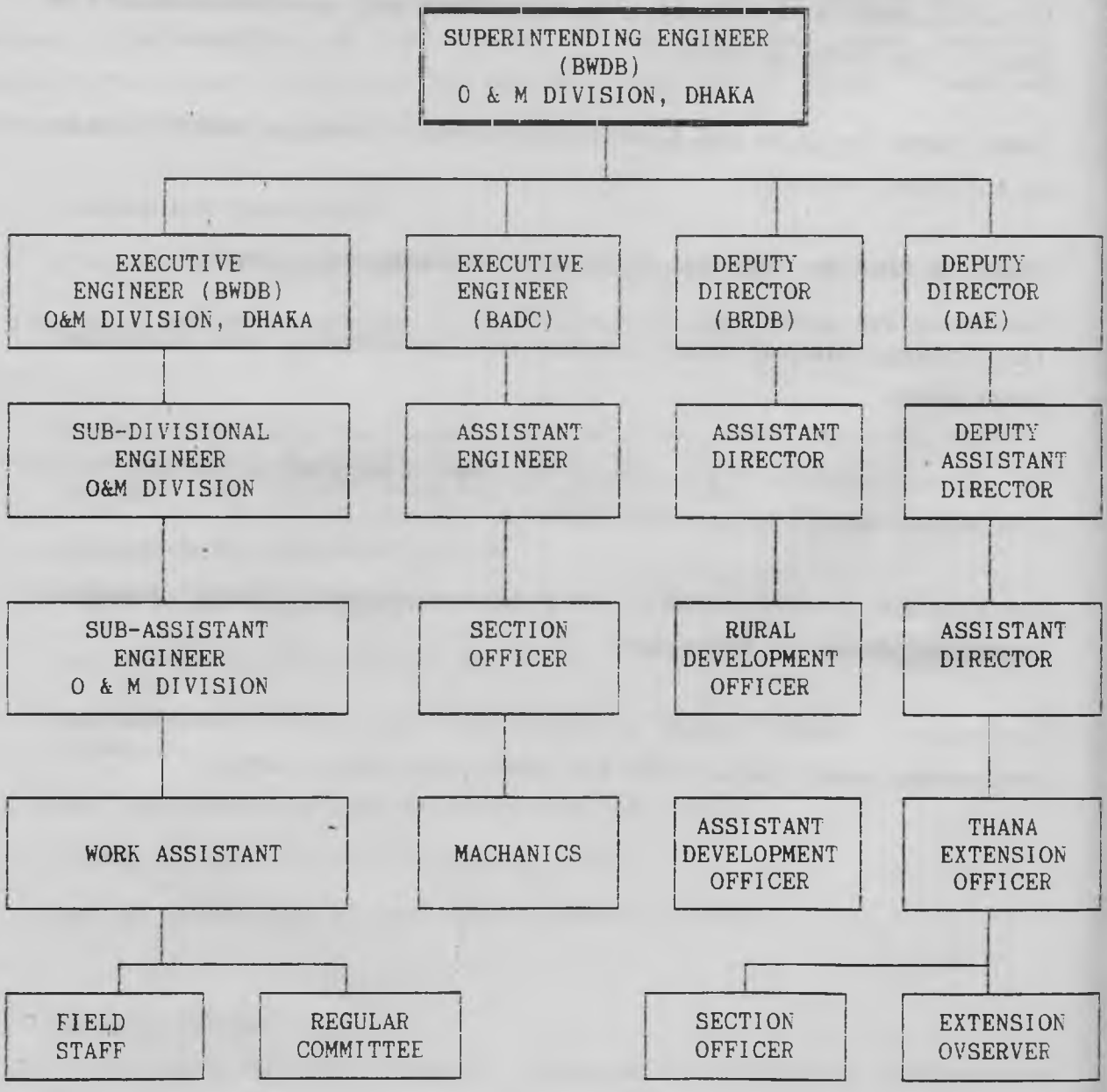
(f) In-house training on O & M should be given to all staff of the project. O & M Manual should be strictly followed.

(g) Participation of beneficiaries in the project management through Regulator Committee should be encouraged.

(h) Government should adopt a policy for fostering inter-department cooperation among BADC, BRDB and DAE in the Project area.

FIG. 3.2

ORGANOGRAM OF BARANAI RIVER SUB-PROJECT



CHAPTER 4

INSTITUTIONAL ASPECTS: COORDINATION AND INTERACTIONS

4.1 Proposed Institutional Linkages

Baranai river Project. as a sub-project of SSISP, has certain distinctive features which distinguishes itself from other water sectors projects in Bangladesh. They are: (a) projects with short-gestation period to be implemented within three years and (b) low investment cost not exceeding $1000 per acre. In order to implement and operationalise the projects, an interdisciplinary approach was proposed with a number of agencies performing various interdependant and mutually reinforcing activities. The roles and supportive activities were identified and assigned to different agencies to ensure maximum possible coordination of efforts needed for successful implementation of the project. The major responsibilities, as foreseen during project preparation. for different agencies are summarised below.

1. *Bangladesh Water Development Board (BWDB)*

The BWDB was the principal executing agency for the Project. Its Project Office located in Dhaka under the Director, Planning Schemes II, was specifically responsible for:

- selection, formulation, appraisal and detailed design of the project;
- operation and maintenance of completed facilities

2. *Bangladesh Agricultural Development Corporation (BADC)*

The BADC, co-executing agency for the project, with a project office in Dhaka was charged with the following responsibilities:

- procurement, distribution. and installation of irrigation equipments;
- repair of mechanical facilities;
- supply of sufficient quantity of diesel fuel and lubricants to farmers at cost;

- supply of farm inputs such as seeds and fertilizers;
- selection of field demonstration farms in coordination with BRDB and DAE.

3. Bangladesh Rural Development Board (BRDB)

The BRDB, as the lead agency for the development of TCCA/KSS, was expected to perform the following activities:

- promotion, organization and supervision of TCCA/KSS for joint ownership and/or maintenance of facilities,
- designation of field demonstration farms in conjunction with the BADC and DAE.

4. Department of Agricultural Extension (DAE)

The DAE was committed to:

- channel information on modern crop production technologies, including fertilizer use, pest control and water management;
- locate, in coordination with the BRDB and BADC, appropriate field demonstration farms.

5. Bangladesh Krishi Bank (BKB), Bangladesh Samabaya Bank Ltd (BSBL) and Sonali Bank (SB)

With the support of the Bangladesh Bank (BB), the BKB, BSBL and SB were supposed to constitute the main sources of agricultural credit - both short and long-terms for purchase of inputs and equipments.

It was proposed that a Project Coordinating Committee (PCC) would be constituted for overall coordination. The PCC would be assisted by a Project Monitoring and Evaluation Unit (PMEU).

4.2 Project Implementation and Operation and Maintenance

Bangladesh Water Development Board (BWDB), as mentioned earlier was assigned the responsibility of full time supervision of project construction under the direction of field Executive Engineer and with periodic supervision by the SSISP Directorate. For development of irrigation, it was emphasized the proper liaison be maintained among SSISP officials, BRDB and BADC in order to maximise

the uptake of planned irrigation facilities on which the achievement of project benefits would depend to a significant extent. It was envisaged that the staffs of SSISP would meet with BRDB and BADC officials and TCCA Chairman in the project area to inform them of the facilities provided and the opportunities for expansion of irrigation. Appropriate action were also planned for supply of irrigation equipments from BADC and/or private dealers.

Although command area development (CAD) was not the direct responsibility of SSISP, the achievement of full benefits of the project area was related to CAD. Hence, maximum field level support was necessary through Irrigation Management Programme (IMP) to achieve full development operating through the BRDB, BADC and TCCA system. Since command area development was considered to be an important element to ensure full development of irrigation, the SSISP Directorate was supposed to play a leading role in enhancing IMP in the project area.

It was envisaged that after completion of the project, BWDB would be legally responsible for its operation and maintenance. It was envisaged that Operation Committee be established for the project structures through relevant TCCA chairman and BRDB officials, KSS managers and others. The Committee would decide the policy regarding operation of the structures. It was emphasized that the Operation Committee should be formed and its policy established before the completion of project construction. In case of maintenance of the project, the responsibility was vested with BWDB and proposed to be executed by BWDB field office from their annual budget. The maintenance of the irrigation equipment, on the other hand, was the responsibility of the farmers/KSS with minor distribution system.

It is thus amply evident from above discussion the appraisal reports delineated to a significant extent the responsibility of each of the agencies involved in the Baranai project and also outlined the nature of inter-agency coordination so vitally needed for its proper implementation, operation and maintenance.

4.3 Coordination in Actual Practice

In actual practice, hardly any coordination has been observed among different agencies along the lines suggested in the Appraisal Reports, as discussed in the preceding sections. At present, there exist no inter-agency linkage programmes. Many of the concerned officials at the Thana levels seem to be unaware of the existence of the project. The Agencies have their own programme which they are operating quite independently in the project area without any coordinated efforts in order to derive fully the potential benefits of the project.

In order to implement the proposed institutional and other actions needed for fully materialising the project benefits, BWDB was supposed to maintain close liason with other agencies. Such liason does not seem to have been maintained. After completion of the project, BWDB is broadly concerned with its operation and maintenance. These aspects have already been discussed in Chapter 3 earlier. The operation has been primarily the local committee's responsibility, while the overall maintenance has been discharged by BWDB. It is reported in the field survey that the committees are performing well and no negative incidents have been reported so far. However, it is learnt from the field survey that although the concerned Section Officer and Work Assistant occasionally visit the project sites with the visit of XEN and SDO, no systematic monitoring of the project takes place. Communication with higher officials usually involves budgetary allocation for maintenance work. Also, it was felt that although the present O/M schedule was effective, problem arose due to lack of funding which constrained necessary maintenance work.

Agencies other than BWDB, as mentioned earlier, were found mostly unaware of the proposed coordination. Their present activities are guided by their own departmental concern. For example, there has been significant change in the focus of activities of BADC. The distribution of minor irrigation equipment such as LLP and STW has been completely privatised. Before the implementation of the project, BADC supplied most irrigation equipment installed in the project area. After the completion of the project, it was envisaged that the beneficiaries themselves would organize the installment of irrigation equipment from the market. Thus under the changed circumstances, the role of BADC for the

stipulated activities under the project is absent with no coordination with private sector initiatives in this respect.

Other organizations such as BRDB and DAE also failed to play their respective coordinating role in the project area. The activities of BRDB in the development of TCCA/KSS have not progressed at all. Moreover, the recent decision of the government regarding exemption of agricultural loans (upto Tk. 5000) led to confusion about BRDB loans and hence its overall operation.

Similarly, DAE has failed to make much headway as promoter of HYV technology in the project area. DAE operates independently regardless of the location of SSISP sub-projects and pursues its own plans and programmes in the project area without any coordination.

4.4 Involvement of Local People

In a project of such nature catering to the needs of people living in a small area, there is ample scope of ascertaining both the problems and prospects of the project interventions through discussion with local people. Also, during the operation stage, the involvement of local people is essential in order to derive the maximum benefit from the project both in terms of equity and efficiency. This would involve the timely opening and closing of the regulators as well as regular maintenance of the project structures.

However, our field survey indicate that local people were not involved in the planning, design or even during the implementation stage. This could have offered a scope for better design and more effective implementation of the project. However, BWDB did not face any problem created by local people during project planning and implementation.

Moreover, our field experience shows that Baranai sub-project perhaps represents the only first cycle sub-projects where the local committee are performing reasonably well. Although there is leakage in the regular gates. the committee is responding earnestly to the local need for controlled water. There are Khalashis for gate operation. who operates the gates in accordance with resolution of the committee. The committee is comprised of local elites who hail

from the command area villages for each of the regulators. There is a resolution for each gate operation, no matter whether it is made through a general meeting (as in Bansbhag) involving the chairman, secretary, and other members (who are representatives of their respective villages) along with some ordinary members or by the chairman himself in most of the cases (as in Muchipara and Kaliganj). If there are strong objections from other farmers particularly in case of the latter, a meeting held and previous decision is revised. In case of Bansbhag, the ordinary farmers themselves sometimes take the initiative and ask the Khalashi for gate operation when necessary. The Khalashi takes up the matter with the secretary who then convene a meeting attended by other members in order to arrive at decisions with regard to the gate operation. In other areas such as Kaliganj, only an annual meeting is held in which the members of the committee and the beneficiaries usually assign the responsibility of gate operation to the Khalashi as decided by the chairman. Thus, for the rest of the year, the gate is operated through resolution by the chairman alone. However, the Khalashi who is aware of peoples' need and opinion informs the chairman about peoples need but never operates the gate without any such resolution.

In general, the committees are active and no official complaint ever lodged to BWDB about the activity of the committee. Obviously, the large farmers' interest dominated the decision-making, but the operation was done regularly and the structure was looked after well. There were some disagreements sometimes but it never went beyond control, and differences of opinion were sorted out and resolved by the committee itself. It may be mentioned here that the decision of the committee regarding operation of the regulators is not announced to the public. It is rather the farmers' responsibility to come to know about it. But people can participate in the meeting and (freely) express their opinion.[1]

As mentioned earlier in Chapter 3, there are some problems with the structures of Baranai sub-project. The Bhasbhag regulator requires 4 vents instead of only one, as it stands on the bank of a river, namely Huja river

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[1]It may be noted here that there are a number of villages namely Madanhat, Telkupi, Termini and Basudebpur lying beyond the project area were also benefitted by this sub-project.

falling into the Baranai. During the rainy season, there is an inward pressure of water on this regulator, which it is unable to drain out. As water level increases on both sides of the regulator, it gives way to the pressure in the eastern bank of the river and inundated the low lying lands in a number of villages (e.g. Piprul, Vaturia, Lakshmipur, Hapania, Bakshore including Bhasbhag). It did not happen before as the water had its way out through all the sides. Now, if the people on the eastern bank of the river wants to obstruct water, the thrust is shifted to the west causing flood in the adjoining villages of the western bank. Thus, it causes tension every year in the rainy season in Bansbhag following the construction of the regulator. There was a fight between the people living on either sides of the bank three years ago, because the former built a dam to protect themselves. which was eventually cut off by the people living on the western side of the river. Moreover, the embankment has not followed the river bank everywhere, and as such it leaves the people living in between the river bank and the embankment insecure. Therefore, public cut occurs sometimes, which in turn causes flood in the project area.

4.5 Institutional Interaction with Beneficiaries

The derivation of full benefit and hence the success of the project depends to a significant extent, on adequate interaction between the project officials and the beneficiaries. Our field survey revealed rather low level of institutional interaction with the beneficiaries. Few people were aware of the activities of the concerned departmental officials. People involved in the work site (e.g. surveyor, work assistant, section officer) did not bother to communicate with local people during the implementation of the project. Lack of proper interagency coordination combined with inadequate interaction with the project beneficiaries resulted in the failure to derive fully the project benefits and in some cases, loss of opportunities and even wastage of funds.

Attempts were made during the field survey to ascertain the level of interaction of the concerned officials with the project beneficiaries. The information presented in Table 4.1 indicate that such level of interaction were very low. In terms of awareness of the existence of field officials of different agencies, more than 85 per cent of the households in the project area expressed their ignorance implying very little interactions between them. Only about 13 per

cent of the sample households in the project area expressed their acquaintance with the field level officials of both BADC and DAE. The level of such acquaintance is even lower (only 8.4 per cent) for BRDB officials. The situation in the control area is definitely worse with respect to project officials of BADC and BRDB but significantly better for field level officials from DAE.

Table 4.1

Awareness of People about Concerned Government Officials of Different Organisations in the Project and Control Area

Designation of Staff known	Percentage of Households who are aware					
	Project Area			Control Area		
	BADC	BRDB	DAE	BADC	BRDB	DAE
None	86.7	91.6	86.7	96.0	96.0	52.0
Ag. Officer	-	-	-	-	-	-
Block Supervisor/Inspector	6.1	1.2	12.0	-	-	48.0
Unit/Rural Dev. Officer	-	-	-	-	-	-
Others (specify)	-	-	-	-	-	-
Acquinted with the Staff but ignorant of his/her designation	7.2	7.2	1.2	4.0	4.0	-

Source: BIDS/SSISP Household Level Survey (1992).

The 4.2 provide some information on the nature of changes in some certain institutional aspects of interaction during pre- and post-project conditions.

It is readily observed that although the overall situation remained predominantly static in most of the cases, some significant changes have occurred in both the project and control villages. This is most pronounced in case of the worsening of the terms of non-institutional sources of credit --- about 35 per cent of the sample households in the project area and 68 per cent in the control

area reported an increase in the rate of interest of non-institutional loans. Both the cooperation of government agricultural officers and the activities of the KSS have increased after the implementation of the project. This is particularly true in the control area. which therefore, has nothing to do with project intervention. The difficulties of obtaining loans from the banks has also increased, particularly in the control area.

Table 4.2

Changes in Certain Institutional Aspects: Pre- and Post-Project Situation

Different aspects where changes sought	Project Area				Control Area			
	In-crease	De crease	Static	N.A.	In-crease	De-crease	Static	N.A.
Cooperation of the govt. agricultural officers	21.7 (18)	6.0 (5)	57.8 (48)	14.5 (12)	52.0 (13)	-	36.0 (9)	12.0 (3)
Cooperation of livestock officials	6.0 (5)	4.8 (4)	72.3 (60)	16.9 (14)	20.0 (5)	4.0 (1)	68.0 (17)	8.0 (2)
Difficulties in obtaining loans	15.7 (13)	3.6 (3)	67.5 (56)	13.3 (11)	44.0 (11)	8.0 (2)	40.0 (10)	8.0 (2)
Cooperation among villagers	20.5 (17)	28.9 (24)	47.0 (39)	3.6 (3)	16.0 (4)	20.0 (5)	56.0 (14)	8.0 (2)
Activities of the KSS	20.5 (17)	3.6 (3)	56.6 (47)	19.3 (16)	52.0 (13)	-	36.0 (9)	12.0 (3)
Rate of interest of non-institutional loans	34.9 (29)	2.4 (2)	56.6 47)	6.0 (5)	68.0 (17)	-	24.0 (6)	8.0 (2)
Frequency of the incidence of theft and dacoity	8.4 (7)	51.8 (43)	38.6 (32)	1.2 (1)	8.0 (2)	32.0 (8)	60.0 (15)	-

Source: BIDS/SSISP Household Level Survey (1992).

Note : The figures in the parenthesis indicate the number of sample households.

4.6 Activities of NGOs and Grameen Bank

Although SSISP do not have any specific programme of associating the NGO's with other government organizations about project activities, the project facilitate communication and encourage activities of NGO's in the project area. In the Baranai project area, a number of NGOs notably Grameen Bank and BRAC had been operating. Table 4.3 provide the list of NGOS and their activities. It is readily evident that ten out of seventeen villages surveyed in the project area reported the existence of NGO programmes. of which eight villages have active programmes. No NGO's was found to be operating in eight villages in the project area. Grameen Bank Credit Programme has been introduced in three project villages.

The survey also indicate that BRAC has been providing "very good" services in two project villages, "good" services in five project villages and performing moderately in one villages in the project area. Grameen Bank has been providing excellent services in the two villages it has its own credit programme. However, it is not clear whether and to what extent any of these can be attributed to project interventions.

Table 4.3

A List of NGO's and their Activities in the Project and Control Areas

Villages	Name of NGO	Year of Establishment	Aims and Activities	No. of households who participated	Extent of Usefulness: Not good = 1, More or less good = 1, Good = 3, Very good = 4
Project Area:					
Paschim Haguria	BRAC	1988	Savings, credit Programme & Literacy	40	4 (Very Good)
Churmonbati	--	--	--	--	--
Banshvag	--	--	--	--	--
Bishnupur	BRAC	1986	Credit & other Development activities	5	4
Thakur Lakshmikul	Grameen Bank	1991	Credit Programme	100	4
	Alfa Project	1991	Training for self-reliance, aforestation, prepare oral saline	90	4
Vaturia Lakshmikul	--	--	--	--	--
Durgapur	--	--	--	--	--
Kaliganj	--	--	--	--	--
Salimpur Roy Amhati	BRAC	1991	Education & savings	45	3 (Good)
Purba Haguria	BRAC	1984	Education & Savings	70	3 (Good)
Chowdhury Bargacha	BRAC	1990	Education Credit	20	3 (Good)
Shampur	BRAC	1992	Credit, Education & Agricultural Inputs	50	3
Madhabpur	--	--	--	--	--
Hapania	Grameen Bank	1991	Credit and Savings	20	1
Noapara	--	--	--	--	--
Biprable Gharia	Grameen Bank	1990	Self-reliance Programme	30	4
	BRAC	1991	Credit for Landless	?	2 (comment. rate of interest is high)
Tegachi	BRAC	1989	Economic Development	20	3
Control Areas:					
Khramkuri	--	--	--	--	--

Source: BIDS/SSISP Village Level Survey (1992).

CHAPTER 5

IMPACT ON AGRICULTURAL PRODUCTION

5.1 Pre-Project Situation

Baranai River sub-project is located adjacent to the Baranai river near Natore in Rajshahi district (old). It is adjacent to and north-west of Chalan Beel Polder B. The project covers an area of 5080 hectares. The South-western part of the area is relatively high with a downward elevation towards the north-west.

Flooding of the area during the monsoon and inadequate drainage in the months of October and November were the main problems of the area. The bank of the Baranai river is low in some places. Flood water from the river used to overspill the bank thereby submerging the young crops in the Project area. This overbank spilling occurred in almost every year, causing damage to Aus crop as well as Aman and Jute at their early stages. Pre-project cropped area and yield are shown in Table 5.1 below. The pre-project cropping pattern seem to have been dominated by local varieties of Broadcast Aus and Aman with a share of about 30 per cent each. Local T. Aman and Mixed Aus/Aman claimed about one-fifth of the net cropped area in the pre-project situation. The cropping pattern was thus adjusted to the flooding conditions (both depth and duration of flooding) obtaining in the project area. The diffusion of high yielding varieties on the other hand, was quite low, with HYV T. Aman and HYV Boro having a share of only 8.3 and 5.2 per cent respectively. This should be attributed to both the risk of monsoon flooding and lack of inadequate irrigation during the dry season. Floods lowered crop yields and production with little incentive for farmers to adopt high yielding varieties of crop and use cash-intensive yield-raising inputs.

5.2 Project Objectives

The objectives of the Baranai project were to provide protection against the monsoon flood, improve the interior drainage system and provide irrigation in most of the project area. It was expected that areas provided with flood

Table 5.1

Pre-Project Crop Areas and Yields

Crop	Cropped Area (ha)	% of Net Cropped Area	Average Yield (Ton/ha)
B. Aman	1135	29.2	1.37
T. Aman (Local)	850	21.9	1.65
T. Aman (HYV)	325	8.3	2.74
B. Aus	1175	30.2	1.28
Jute	365	9.4	1.10
Mixed B. Aus/Aman	405	10.4	2.01
HYV Boro	200	5.2	3.20
HYV Wheat	890	22.9	1.56
Pulses	405	10.4	0.64
Oilseeds	160	4.2	0.55
Sugarcane	565	14.6	32.02
Others	325	8.3	-
Total	**6800**	**175.0**	-

Source: Estimated from BWDB Appraisal Report (1981).

protection, drainage and irrigation facilities would switch to more remunerative cropping patterns. The project aimed at meeting the national plan objective of increasing food production and reducing poverty through intensification of agricultural activities in the area. The expected benefits of the project were:

(a) prevent monsoon floods and reduce drainage congestion to intensify monsoon crop cultivation

(b) provide incremental rice production of 6500 ton annually (Table 5.2)

(c) increase cropping intensity from 175 per cent to 221 per cent

(d) provide irrigation facilities in the project area and thereby increase in rice yields.

Table 5.2

Summary of Expected Impact on Rice Production

Crops	Without Project			With Project			Incremental Production (Mt)
	Area (ha)	Yield (Mt/ha)	Output (Mt)	Area (ha)	Yield (Mt/ha)	Output (Mt)	
B. Aus	1175	1.28	1504	840	2.01	1688	+184
Mixed B. Aus/Aman	405	2.01	815	0	-	0	-815
B.Aman	1135	1.37	1555	805	2.01	1618	+63
T. Aman (Local)	850	1.65	1400	505	2.56	1290	-110
T. Aman (HYV)	325	2.74	890	775	4.12	3195	+2305
Boro (HYV)	200	3.20	640	405	4.57	1850	+1210
T. Aus (HYV)	0	-	0	810	4.57	3700	+3700
Total	4090	-	6804	4140	-	13341	+6537

Source: Estimated from BWDB Appraisal Report (1981).

5.3 Cropping Pattern and Cropping Intensity

Baranai river project was undertaken to alleviate two major constraints on agriculture in the area; namely, floods and drainage congestion. The impact of the project on agriculture has been in the light of the information collected through administering structured questionnaire among farm-households in both the project as well as control area. As mentioned earlier, in order to assess project impact a control area (comparable to the without project situation) was selected from outside but adjacent to the project area, to compare with the

project. The major indicators used for assessment of project impact on agriculture are: changes in cropped area, cropping pattern, extent of HYV paddy cultivation, cropping intensity, crop yield rates, crop production and output, use of crop inputs and net income from agriculture.

5.3.1 Crop Areas

In the Baranai project area, there has not been any increase in net cultivated area (by bringing previously uncultivated areas under cultivation) since most potentially cultivable land in the area was already cultivated in at least one season before the implementation of the project. However, there has been some changes in the incidence of seasonal cropping. Table 5.3 shows that compared with the pre-project situation, the area cultivated in the Aus season has decreased from about 45 per cent (BWDB, 1981 estimate) to only about 7 per cent (BIDS/SSISP Survey estimate), while it has increased from about 65 per cent to about 82 per cent in Aman season and from about 51 per cent to about 85 per cent in the Boro season. While the cropping in Aus season has declined mostly due to B. Aus (by about 29 per cent), the increase in Aman season and Boro season cropping should be attributed to increase in HYV T. Aman (by about 15 per cent) and HYV Boro (by about 36 per cent) respectively. It is thus evident that the decline in Aus season cropping is due to the fact that more profitable HYV Boro is now cultivated in the project area and the seasons overlap each other. (However, whether this can be attributed to the project intervention remains an open question.)

As indicated above, cropping intensity in Boro season has increased by about 34 per cent in the project area compared to the pre-project situation. This has been mostly due to dissemination of HYV Boro. However, compared with the control area, the intensity is lower in the project area -- 85 per cent as against 93 per cent (Table 5.4). The fact is that there has been expansion of private minor irrigation (mainly STW) in both the areas in the last decade. Hence, benefits arising out intensification of cropping in the Boro season can hardly be (directly) attributable to the project.

Table 5.3

Crops and Crop Areas: Pre- and Post-Project Conditions

(% of net cultivated area)

Crops	Pre-project	Post-project	Difference
Aus Season			
B. Aus	30.2	1.3	-28.9
Mixed B. Aus and Aman	5.2	2.7	-2.5
Jute	9.4	2.8	-6.6
Sub-Total	**44.8**	**6.8**	**-38.0**
Aman Season			
Local T. Aman	51.0	52.3	+1.3
HYV T. Aman	8.3	23.1	+14.8
Mixed B. Aus and Aman	5.2	2.7	-2.5
Other	-	4.0	+4.0
Sub-Total	**64.5**	**82.1**	**+17.6**
Boro/Rabi Season			
HYV Boro	5.2	40.7	+35.5
HYV Wheat	22.9	5.3	-17.6
Local Wheat	-	2.3	+2.3
Pulses	10.4	20.5	+10.1
Oilseeds	4.2	2.6	-1.6
Others	8.3	13.2	+4.9
Sub-total	**51.0**	**84.6**	**+33.6**
Annual Crop			
Sugarcane	14.6	5.7	-8.9
Cropping Intensity (%)	174.9	179.2	+4.3

Source: Pre-Project - Estimated from BWDB Appraisal Report (1981).
Post-Project - BIDS/SSISP Household Survey (1992).

Table 5.4

Distribution of Cultivated Land in Project and Control Area

(% of net cultivated land)

Crops	Project	Control	Difference (Project - Control)
Aus Season			
B. Aus	1.3	-	+1.3
Mixed B. Aus and Aman	2.7	-	+2.7
Jute	2.8	-	+2.8
Sub-Total	**6.8**	-	**+6.8**
Aman Season			
Local Aman	52.3	31.57	+20.8
HYV T. Aman	23.1	0.9	+22.2
Mixed B. Aus and Aman	2.7	-	+2.7
Other	4.0	-	+4.0
Sub-Total	**82.1**	**32.4**	**+49.7**
Boro/Rabi Season			
HYV Boro	40.7	72.0	-31.3
HYV Wheat	5.3	13.2	-7.9
Local Wheat	2.3	0.6	+1.7
Pulses	20.5	2.8	+17.7
Oilseeds	2.6	4.4	-1.8
Others	13.2	-	+13.2
Sub-total	**84.6**	**93.0**	**-8.4**
Permanent Crop			
Sugarcane	5.7	-	+5.7
Cropping Intensity	179.2	125.4	53.8

Source: BIDS/SSISP Household Survey (1992).

The picture, however, is quite different in the Aman season. Compared to the pre-project situation, land cultivated in the season has increased from about 65 per cent to about 82 per cent (Table 5.3). This is mostly due to dissemination of HYV Aman in the project area. This points to the success of the project in protecting crops from monsoon flood damages. This becomes more evident when one compare the cropping intensity in Aman season in project area with that in

the control area. Table 5.4 shows that more than 80 per cent of the land is cultivated in this season in the Project area as against only 32 per cent in the control area. Reduced flood depths and duration due to embankment thus appear to have had significant positive impact on cropping in the Aman season. That the construction of embankment has brought about considerable hydrological changes in the project area by way of reduction of depth and duration of floods has been explained earlier in the Report (Chapter 3). This is also reflected in the distribution of cultivable area by land level in project and control area as presented in Table 5.5. Proportion of land flooded more than 90 cm of depth represents more than 80 per cent of both owned and operated land in the control area (comparable to without project situation) as compared to about 65 per cent in the Project area.

Table 5.5

Distribution of Cultivable Area by Land Level and Farm Size

(Per cent)

Farm Size	High		Medium High		Medium Low		Low		Very Low	
	Pro-ject	Con-trol	Pro-ject	Con-trol	Pro-ject	Con-trol	Pro-ject	Con-trol	Pro-ject	Con-trol
Owned Land										
0.00-0.20	-	-	3.64	-	16.36	-	50.91	-	29.09	-
0.21-1.01	1.42	-	9.86	-	29.32	8.36	38.10	14.63	21.30	77.00
1.02-2.03	-	-	-	7.10	21.55	11.93	48.20	23.01	30.25	57.95
2.03 & above	3.73	-	9.75	8.92	23.37	16.01	41.04	30.74	22.19	44.33
All Farms	2.32	-	7.93	4.47	24.58	11.74	41.71	21.91	23.45	61.87
Operated Land										
0.00-0.20	9.57	-	1.91	-	19.14	-	54.07	-	15.31	-
0.21-1.01	1.37	-	10.39	-	27.54	15.63	43.64	24.89	17.07	59.48
1.02-2.03	-	-	-	-	22.03	-	55.93	-	22.03	100.00
2.03 & above	4.78	-	4.06	11.48	16.44	20.73	51.88	20.73	22.83	46.97
All Farms	3.05	-	5.25	2.99	21.22	15.36	50.08	21.29	20.41	60.36

Source: BIDS/SSISP Household Survey (1992)

5.3.2 Cropping Pattern

Paddy dominates the cropping pattern in both the Project and control area but this dominance is more pronounced in the latter (83%) as compared to the former (68%). This may be compared with the percentage of total gross cropped area devoted to paddy (66 per cent) in the pre-project situation (Table 5.5).

Within the paddy cropping pattern, however, some varietal change seem to have taken place due to the project in the Aman season. HYV T. Aman occupies about 13 per cent of gross cropped land in the Project area as compared to about 5 per cent in the pre-project situation and less than one per cent in the control area.

Compared with the pre-project situation, there has been significant change in the cultivation of HYV Boro paddy in the Project area. But this is not a project impact since an even greater proportion of gross cropped land is devoted to the growing of HYV Boro in the control area. What has happened is that with the expansion of minor irrigation facilities in both the Project and control areas, the farmers have shifted land from Aus to HYV Boro as it is more profitable to grow the latter as compared to the former.

5.3.3 Diffusion of HYV Paddy

In common with any FCD/I projects, one of the main objectives of Baranai project has been to induce an expansion of high yielding varieties of paddy in different seasons and thereby contribute to increased crop production in the project area. Table 5.5 shows that compared to the pre-project situation more HYV's are now cultivated in the Project area in both Aman and Boro season. Taken together, HYV paddy now occupy about 64 per cent of the net cultivated land in the Project area as compared to only 14 per cent in the pre-project situation. However, as explained earlier, all of these cannot be attributed to the Project. The switch to HYV paddy in the Aman season is due to the Project as it now protects the crop from monsoon flood damages. The fact that there is hardly any cultivation of HYV T. Aman in the control area tend to confirm this. The dissemination of HYV Boro, on the other hand, has been induced by autonomous expansion of minor irrigation facilities in both the Project as well as control area (and more so in the control area with much higher proportion of

Table 5.6

Cropping Pattern in Project and Control Area

(% of gross cropped area)

Crops	Project	Control	Pre-Project	Target
B. Aus	0.73	-	17.26	9.95
T. Aus (HYV)	-	-	-	9.56
Mixed B. Aus and Aman	2.99	-	5.95	-
Jute	1.57	-	5.36	4.30
Local Aman	29.14	25.14	29.17	15.50
HYV T. Aman	12.47	0.68	4.76	9.18
HYV Boro	22.68	57.43	2.98	4.78
HYV Wheat	2.93	10.51	13.10	19.13
Local Wheat	1.31	0.49	-	-
Pulses	11.42	2.27	5.95	8.61
Oilseeds	1.45	3.48	2.38	4.78
Sugarcane	3.18	-	8.33	7.17
Others	9.92	-	4.76	7.04
Total (%)	100.00	100.00	100.00	100.00
Gross Cropped Area (ha)	68.84	26.45	6800	8465
Net Cultivated Area (ha)	38.33	21.10	3890	3835
Cropping Intensity	179.60	125.36	174.81	220.73

Source: Pre-Project - Estimated from BWDB Appraisal Report (1981).
Post-Project - BIDS/SSISP Household Survey (1992).

Table 5.7

Adoption of HYV Paddy

Crops	% of Net Cultivated Land			% of Gross Cropped Area		
	Project	Control	Pre-Project	Project	Control	Pre-Project
HYV T. Aman	23.1	1.0	8.3	12.5	0.7	4.8
HYV Boro	40.7	72.0	5.2	22.7	57.4	3.0
All HYV (%)	63.8	73.0	13.5	35.2	58.1	7.8
Total Land (ha)	38.3	21.1	9,600	68.8	26.5	16,800

Source: Pre-Project - Estimated from BWDB Appraisal Report (1981).
Post-Project - BIDS/SSISP Household Survey (1992).

land under Boro HYV cultivation). Hence, this cannot be attributed to the project.

5.3.4 Cropping Intensity

As shown in Table 5.4, the cropping intensity in the Project area is much higher than in the control area -- 179 per cent as against 125 per cent. In the Aus season when no crop is grown in the control area, the situation is only slightly better (6.8 per cent) in the Project area. In the Boro season, land is intensively cultivated in both the Project area (85 per cent) and control area (93 per cent). However, it is in the Aman season that difference in the pattern and intensity of land use become markedly pronounced -- 82 per cent in the Project area as compared to only 32 per cent in the control area. This signify positive Project impact on cropping intensity in the Aman season, by way of reduction in flood depths and duration in Project area.

However, compared to the pre-project situation, as Table 5.3 shows, there has only been a marginal increase in the annual cropping intensity in the Project area (from 175 per cent to 179 per cent). Also, this remains far below what was targetted earlier (221 per cent, BWDB Appraisal Report, 1981).

5.3.5 Crop Yields

Increase in average yield in the Project area due to flood control, drainage and irrigation can be expected to arise from three sources -- switch from local to transplant varieties and/or HYVs, more intensive use of modern inputs due to lower perceived risk of crop failure and reduced flood damages. In Baranai Project area, all of these factors contributed to raise the average yields of paddy considerably. Compared to pre-project situation, the average yield of paddy (weighted average over all season) has increased from 1.67 MT to 3.69 MT per hectare (Table 5.8). Moreover, all the paddy crops, in every season, now reap higher yields ranging from an incremental 0.42 MT/ha for local Aman to 2.63 MT/ha for HYV Boro, compared to the pre-project yield rates. Also, the yield of Local Aman, the most important monsoon crop is higher in the Project area as compared to the control area, which suggests that the embankment has been successful in protecting the crop from damages due to floods. There has been two noticeable varietal change in paddy - one to HYV T. Aman and the other to HYV Boro with resulting higher yields for these crops in the Project area. However, as explained earlier, while the former can be attributed as a Project impact, the latter cannot (with control area recording a higher yield than Project area).

In case of non-paddy crops, the impact of the Project is not so clear. The yield rate of oilseeds is higher in the Project area as compared to the control area (0.31 MT/ha) while the reverse is true in case of pulses (0.49 MT/ha). In case of wheat (both Local and HYV) there is hardly any difference in the yield rates in the two areas.

5.3.6 Crop Production and Output

Changes in total crop output is dictated by reduction in flood damages, shift in favour of HYVs and increase in cropping intensity. In case of Baranai Project, all these three factors contributed to an increase in paddy output in the Project area by more than ten thousand metric tons as compared to the pre-project situation (Table 5.9). As a result, the target paddy production is exceeded by about four thousand metric tons. However, as discussed earlier, not all of this can be attributed to the Project. Most of incremental production (about 85 per cent) comes from HYV boro which is due to non-project related

Table 5.8

Yields of Different Crops in Project and Control Area

(Mt/hectare)

Crops	Project	Control	Pre-Project	Target
Paddy Crops				
B. Aus (Local)	1.73	-	1.28	2.01
T. Aus (HYV)	-	-	-	4.57
B. Aus/Aman (Mixed)	3.67	-	2.01	-
Local Aman	1.91	1.03	1.49	2.22
T. Aman (HYV)	4.06	-	2.74	4.12
Boro (HYV)	5.83'	6.66	3.20	4.57
All Paddy (weighted average)	3.69	-	1.67	3.22
Non-Paddy Crops				
Jute	1.64	-	1.10	1.46
Wheat (Local)	2.26	2.22	-	-
Wheat (HYV)	2.17	2.17	1.56	3.66
Pulses	1.39	1.86	0.64	1.10
Oilseeds	0.80	0.49	0.55	1.10
Sugarcane	41.74	-	32.02	50.31

Source: Pre-Project - Estimated from BWDB Appraisal Report (1981).
Post-Project - BIDS/SSISP Household Survey (1992).

Table 5.9

A Comparison of Acreage and Output of Paddy Crops

Crops	Pre-Project			Post-Project			Target		
	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)
B. Aus (Local)	1175	1.28	1504	52	1.73	90	840	2.01	1688
T. Aus (HYV)	-	-	-	-	-	-	810	4.57	3700
B. Aus/Aman (Mixed)	405	2.01	815	208	3.67	763	-	-	-
Local Aman	1985	1.49	2958	2030	1.91	3877	1310	2.22	2908
T. Aman (HYV)	325	2.47	890	870	4.06	3532	775	4.12	3195
Boro (HYV)	200	3.20	640	1580	5.83	9211	405	4.57	1850
Total	**4090**		**6807**	**4740**		**17473**	**4140**		**13341**

Note : Area for different varieties of paddy were estimated by extrapolating the cropping pattern of the sampled households by the total paddy cropped land area of the Project

Source: Both pre-project and target area, and yield figures are derived from BWDB Appraisal Report (1981).

expansion of small scale irrigation facilities. In fact, the diffusion of HYV Boro more than compensate for the failure of expansion of HYV Aus as targetted earlier. A significant proportion of incremental production is derived from the cultivation of HYV T. Aman which is a project impact, made possible by the construction of embankment through lowering of depth and duration of flood in the area. However, there is scope of further expansion of HYV Aman through removal of drainage congestion particularly in the Northwestern part of the Project area.

Table 5.10 indicates that although the target of paddy output has been exceeded, the Project has failed to achieve the targetted output for most of the non-paddy crops such as wheat (HYV), oilseed, jute and sugarcane. It appears that expansion of HYV Boro must have been at the cost of cultivation of HYV wheat which falls short of the targetted acreage and output by a considerable margin. The failure of oilseeds to meet the acreage and production target may have been due to cultivation of HYV T. Aman more than what has been targetted in the Project area.

Table 5.10

A Comparison of Acreage and Output of Non-Paddy Crops

Crops	Pre-Project			Post-Project			Target		
	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)
Jute	365	1.10	402	110	1.64	180	365	1.46	533
Wheat (Local)	-	-	-	90	2.26	203	-	-	-
Wheat (HYV)	890	1.56	1388	205	2.17	445	1620	3.66	5929
Pulses	405	0.64	259	795	1.39	1105	730	1.10	803
Oilseeds	160	0.55	88	100	0.80	80	405	1.10	446
Sugarcane	565	32.02	18091	220	41.74	9183	608	50.31	30588

Note : Area for different non-paddy crops were estimated by extrapolating the cropped area of the sample households by the total given cropped area of the Project.

Source: Both pre-project and target area, and yield figures are derived from BWDB Appraisal Report (1981).

Table 5.11

Use of Major Production Inputs in Crop Production in Project and Control Area

(Per Hectare)

Crops	Project			Control		
	Human Labour (mandays)	Fertilizer (Kg)	Irrigation (Tk)	Human Labour (mandays)	Fertilizer (Kg)	Irrigation (Tk)
Paddy Crops						
B. Aus	105	21	0	-	-	-
Mixed B. Aus/Aman	154	77	0	-	-	-
Local Aman	95	31	0	83	23	0
T. Aman (HYV)	151	211	198	39	0	0
Boro (HYV)	177	357	6020	173	353	4581
Non-paddy Crops						
Jute	173	127	0	-	-	-
Wheat (Local)	90	95	0	97	37	0
Wheat (HYV)	81	146	0	88	203	0
Pulses	56	4	0	65	0	0
Oilseeds	67	94	0	117	0	0
Sugarcane	320	525	0	-	-	-

Source: BIDS/SSISP Household Survey (1992).

5.3.7 Crop Production Inputs

One would expect that the use of yield-raising inputs such as irrigation, and fertilizer would be greater in the Project area due to shift from local to HYV and reduced flood risk in the monsoon season. Table 5.11 shows the use of major production inputs in different crops in both Project and control areas. It is readily observed that in case of paddy crops, the use of all three major inputs is greater in the Project area for Local Aman, HYV Aman and HYV Boro where such comparison could be made. Concentrating on monsoon paddy crops which could be directly related to Project intervention, the intensity of input use is considerably higher in the Project area as compared to the control area. The higher use of inputs is reflected in the higher yields of these crops in the Project area as we observed earlier (Table 5.8). The cultivation of non-paddy crops are mostly rain-fed or dependant on residual soil moistures. There is, therefore, hardly any of use of irrigation in these crops in the two areas. The use of human labour, however, is lower in the Project area in the cultivation of wheat (both local and HYV), pulses and oilseeds where such comparison could be made.

5.3.8 Value of Output, Production Cost and Net Return from Crop Production

Total production cost and its breakdown between material and labour costs are shown in Table 5.12. It is readily observed that per hectare production cost for all three paddy crops, namely Local Aman, HYV T. Aman and HYV Boro are higher in the Project area. This, as we observed earlier, is due to greater application of both material inputs and labour in the Project as compared to the control area. Despite higher production costs, per hectare net return of local Aman is greater due to greater yield difference (1.9 Mt/ha in the Project area as compared to 1.1 Mt/ha in the control area) in the Project area by considerable margin (by Tk 4512 per hectare). This is also true for HYV T. Aman, but here comparison become somewhat spurious due to complete damage of the crop in the control area. In case of HYV Boro, on the other hand, net return is lower in the Project area because of both higher production cost and lower yield. For non-paddy crops, net returns for wheat (both local and HYV) and oilseeds are higher while that for pulses is lower in the Project area as compared to the control area.

Table 5.12

Production Costs and Net Return of Different Crops in Project and Control Area

(Per Hectare)

Crops	Project					Control					Difference in Net Return (Tk)
	Material Cost (Tk)	Labour Cost (Tk)	Total Input Cost (Tk)	Gross Return (Tk)	Net Return (Tk)	Material Cost (Tk)	Labour Cost (Tk)	Total Input Cost (Tk)	Gross Return (Tk)	Net Return (Tk)	
Paddy Crops											
B. Aus	2149	4333	6482	10186	3704	-	-	-	-	-	na
Mixed B. Aus/Aman	2524	5169	7693	23158	15465	-	-	-	-	-	na
Local Aman	2429	3673	6102	11949	5849	2066	3425	5491	6826	1335	+4512
T. Aman (HYV)	4122	6134	10256	24364	14108	1280	1572	2852	0	-2852	+16960
Boro (HYV)	10739	7248	17985	35292	17307	9104	7752	16856	38680	21824	-4517
Non-paddy Crops											
Jute	2876	6363	9239	12944	3705	-	-	-	-	-	na
Wheat (Local)	3687	3315	7002	14350	7348	3023	4204	7227	12820	5593	+1755
Wheat (HYV)	3844	2819	6663	13622	6959	4192	3815	8007	11887	3880	+3079
Pulses	897	2286	3183	11788	8605	1991	2748	4739	14885	10146	-1541
Oilseeds	2351	2356	4707	9915	5208	2438	4680	7118	7801	683	+4525
Sugarcane	11948	13045	24993	40725	15732	-	-	-	-	-	na

Source: BIDS/SSISP Household Survey (1992).

Net return for all crops per hectare by farm size categories is shown in Table 5.13. Total net return is observed to be greater in the Project area (Tk. 19712 per ha) than in the control area (Tk. 12132 per ha). In other words, farmer in the impacted area enjoy Tk. 7580 more in terms of net return per hectare of cultivated land at 1991/92 local prices. This essentially represents the combined benefit of HYV boro due to private irrigation expansion (mostly STWs) and of HYV Aman due to construction of embankment in the Project area.

expansion of small scale irrigation facilities. In fact, the diffusion of HYV Boro more than compensate for the failure of expansion of HYV Aus as targetted earlier. A significant proportion of incremental production is derived from the cultivation of HYV T. Aman which is a project impact, made possible by the construction of embankment through lowering of depth and duration of flood in the area. However, there is scope of further expansion of HYV Aman through removal of drainage congestion particularly in the Northwestern part of the Project area.

Table 5.10 indicates that although the target of paddy output has been exceeded, the Project has failed to achieve the targetted output for most of the non-paddy crops such as wheat (HYV), oilseed, jute and sugarcane. It appears that expansion of HYV Boro must have been at the cost of cultivation of HYV wheat which falls short of the targetted acreage and output by a considerable margin. The failure of oilseeds to meet the acreage and production target may have been due to cultivation of HYV T. Aman more than what has been targetted in the Project area.

Table 5.10

A Comparison of Acreage and Output of Non-Paddy Crops

Crops	Pre-Project			Post-Project			Target		
	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)	Area (ha)	Yield (Mt/ha)	Total Output (Mt)
Jute	365	1.10	402	110	1.64	180	365	1.46	533
Wheat (Local)	-	-	-	90	2.26	203	-	-	-
Wheat (HYV)	890	1.56	1388	205	2.17	445	1620	3.66	5929
Pulses	405	0.64	259	795	1.39	1105	730	1.10	803
Oilseeds	160	0.55	88	100	0.80	80	405	1.10	446
Sugarcane	565	32.02	18091	220	41.74	9183	608	50.31	30588

Note : Area for different non-paddy crops were estimated by extrapolating the cropped area of the sample households by the total given cropped area of the Project.

Source: Both pre-project and target area, and yield figures are derived from BWDB Appraisal Report (1981).

Table 5.11

Use of Major Production Inputs in Crop Production in Project and Control Area

(Per Hectare)

Crops	Project			Control		
	Human Labour (mandays)	Fertilizer (Kg)	Irrigation (Tk)	Human Labour (mandays)	Fertilizer (Kg)	Irrigation (Tk)
Paddy Crops						
B. Aus	105	21	0	-	-	-
Mixed B. Aus/Aman	154	77	0	-	-	-
Local Aman	95	31	0	83	23	0
T. Aman (HYV)	151	211	198	39	0	0
Boro (HYV)	177	357	6020	173	353	4581
Non-paddy Crops						
Jute	173	127	0	-	-	-
Wheat (Local)	90	95	0	97	37	0
Wheat (HYV)	81	146	0	88	203	0
Pulses	56	4	0	65	0	0
Oilseeds	67	94	0	117	0	0
Sugarcane	320	525	0	-	-	-

Source: BIDS/SSISP Household Survey (1992).

5.3.7 Crop Production Inputs

One would expect that the use of yield-raising inputs such as irrigation, and fertilizer would be greater in the Project area due to shift from local to HYV and reduced flood risk in the monsoon season. Table 5.11 shows the use of major production inputs in different crops in both Project and control areas. It is readily observed that in case of paddy crops, the use of all three major inputs is greater in the Project area for Local Aman, HYV Aman and HYV Boro where such comparison could be made. Concentrating on monsoon paddy crops which could be directly related to Project intervention, the intensity of input use is considerably higher in the Project area as compared to the control area. The higher use of inputs is reflected in the higher yields of these crops in the Project area as we observed earlier (Table 5.8). The cultivation of non-paddy crops are mostly rain-fed or dependant on residual soil moistures. There is, therefore, hardly any of use of irrigation in these crops in the two areas. The use of human labour, however, is lower in the Project area in the cultivation of wheat (both local and HYV), pulses and oilseeds where such comparison could be made.

5.3.8 Value of Output, Production Cost and Net Return from Crop Production

Total production cost and its breakdown between material and labour costs are shown in Table 5.12. It is readily observed that per hectare production cost for all three paddy crops, namely Local Aman, HYV T. Aman and HYV Boro are higher in the Project area. This, as we observed earlier, is due to greater application of both material inputs and labour in the Project as compared to the control area. Despite higher production costs, per hectare net return of local Aman is greater due to greater yield difference (1.9 Mt/ha in the Project area as compared to 1.1 Mt/ha in the control area) in the Project area by considerable margin (by Tk 4512 per hectare). This is also true for HYV T. Aman, but here comparison become somewhat spurious due to complete damage of the crop in the control area. In case of HYV Boro, on the other hand, net return is lower in the Project area because of both higher production cost and lower yield. For non-paddy crops, net returns for wheat (both local and HYV) and oilseeds are higher while that for pulses is lower in the Project area as compared to the control area.

Table 5.12

Production Costs and Net Return of Different Crops in Project and Control Area

(Per Hectare)

Crops	Project					Control					Difference in Net Return (Tk)
	Material Cost (Tk)	Labour Cost (Tk)	Total Input Cost (Tk)	Gross Return (Tk)	Net Return (Tk)	Material Cost (Tk)	Labour Cost (Tk)	Total Input Cost (Tk)	Gross Return (Tk)	Net Return (Tk)	
Paddy Crops											
B. Aus	2149	4333	6482	10186	3704	-	-	-	-	-	na
Mixed B. Aus/Aman	2524	5169	7693	23158	15465	-	-	-	-	-	na
Local Aman	2429	3673	6102	11949	5849	2066	3425	5491	6826	1335	+4512
T. Aman (HYV)	4122	6134	10256	24364	14108	1280	1572	2852	0	-2852	+16960
Boro (HYV)	10739	7248	17985	35292	17307	9104	7752	16856	38680	21824	-4517
Non-paddy Crops											
Jute	2876	6363	9239	12944	3705	-	-	-	-	-	na
Wheat (Local)	3687	3315	7002	14350	7348	3023	4204	7227	12820	5593	+1755
Wheat (HYV)	3844	2819	6663	13622	6959	4192	3815	8007	11887	3880	+3079
Pulses	897	2286	3183	11788	8605	1991	2748	4739	14885	10146	-1541
Oilseeds	2351	2356	4707	9915	5208	2438	4680	7118	7801	683	+4525
Sugarcane	11948	13045	24993	40725	15732	-	-	-	-	-	na

Source: BIDS/SSISP Household Survey (1992).

Net return for all crops per hectare by farm size categories is shown in Table 5.13. Total net return is observed to be greater in the Project area (Tk. 19712 per ha) than in the control area (Tk. 12132 per ha). In other words, farmer in the impacted area enjoy Tk. 7580 more in terms of net return per hectare of cultivated land at 1991/92 local prices. This essentially represents the combined benefit of HYV boro due to private irrigation expansion (mostly STWs) and of HYV Aman due to construction of embankment in the Project area.

Table 5.13

Total Crop Return Per Hectare of Land by Farm Size Categories in Project and Control Areas

Farm Size	Project		Control		Difference	
	Gross Return (Tk)	Net Return (Tk)	Gross Return (Tk)	Net Return (Tk)	Gross Return (Tk)	Net Return (Tk)
0.00 - 0.20	34371	21714	-	-	-	-
0.21 - 1.01	30287	18179	23978	12952	6309 (26.3)	5227 (40.4)
1.02 - 2.02	25201	14345	22518	10058	2683 (11.9)	4287 (42.6)
2.03 & above	36051	24110	18533	6747	17518 (94.5)	17363 (257.3)
All Farms	**31766**	**19712**	**23342**	**12132**	**8424 (36.1)**	**7580 (62.5)**

Source: BIDS/SSISP Household Survey (1992).

5.4 Project Targets and Achievements

The overall agricultural situation of the Baranai Project area has undergone considerable changes over time, particularly compared to the pre-Project situation. Although the changes in cropping intensity has been marginal, the paddy production has increased significantly compared to pre-project situation, and even exceeded the target production level by 4132 metric tons. However, as mentioned earlier, not all of these changes can be attributed to the Project. Some of these changes are autonomous and have occurred in the control area simultaneously. The expansion of irrigation facilities, particularly the installation of STWs has been initiated by the private sector in both the Project and control areas. The Project has had little to do with expansion of irrigation, which, as we observed earlier, greatly increased the acreage and production of HYV Boro in both the Project and control areas alike. In fact, both the incidence of irrigation and diffusion of HYV (as measured by the percentage of net cultivated land irrigated and devoted to HYV) is observed to be higher in the control area as compared to the Project area (Table 5.14).

Table 5.14

Source of Irrigation and Adoption of HYV of Foodgrain by Farm Size Categories

(A): Source of Irrigation (area in hectare)

Farm Size	Project					Control				
	Groundwater		Surfacewater		Total	Groundwater		Surfacewater		Total
	DTW	STW	LLP	Traditional		DTW	STW	LLP	Traditional	
0.00 - 0.20	-	0.76	-	-	0.76	-	-	-	-	-
0.21 - 1.01	0.20	5.20	0.34	-	5.74	-	2.89	7.01	0.04	79.94
1.02 - 2.02	-	5.27	-	-	5.27	-	1.07	0.80	-	1.87
2.03 & above	-	5.47	-	-	5.47	-	2.46	2.06	-	4.53
All Farms	**0.20**	**16.70**	**0.34**	**-**	**17.25**	**-**	**6.43**	**9.88**	**0.04**	**16.34**
	(0.52)	**(43.62)**	**(0.89)**	**(-)**	**(45.00)**	**(-)**	**(30.47)**	**(46.82)**	**(0.19)**	**(77.44)**

(B): Adoption of HYV (area in hectare)

	Project		Control	
	Area	% of Net Cultivated Land	Area	% of Net Cultivated Land
0.00 - 0.20	1.31	62.98	-	-
0.21 - 1.01	8.13	64.46	12.07	89.34
1.02 - 2.02	6.38	89.99	1.74	17.58
2.03 & above	10.65	63.62	4.34	57.18
All Farms	**26.47**	**69.06**	**18.15**	**86.02**

Source: BIDS/SSISP Household Survey, 1992.

However, the Project has attained considerable success in protecting the monsoon crops and bringing about shift in cropping pattern in favour of HYV in the Aman season. This is reflected in both the average yield and acreage devoted to cultivation of Aman crops in the Project area compared to both the control area and pre-project situation. The average yield of local aman is 1.91 Mt per hectare, which is o.88 Mt per hectare higher than that in the control area. The average yield of local aman was 1.49 Mt/ha before the implementation of the Project (Table 5.8). The higher yield represents a direct benefit of the embankment which now protects the crop from flood damages. Moreover, the reduced depth and duration of flooding due to embankment has led to expansion of HYV T. Aman in the Project area. The percentage of net cultivated land devoted to the cultivation of HYV Aman has increased by about 15 per cent as

compared to the pre-project situation, and is about 22 per cent higher than that attained in the control area. There is, however, scope of further expansion of HYV Aman through removal of drainage congestion in the northwestern part of the Project area. Drainage problem is also partly responsible for the low coverage of Rabi crops, particularly cultivation of oilseeds in the Project area.

The cropping intensity is only marginally higher than in the pre-Project situation and falls short of the target by about 40 per cent. Cropping intensity is a poor indicator of overall crop production performance when low-value crops are substituted by high-value crops in different seasons. This is exactly what has happened in the Baranai Project area when more profitable HYV Boro has replaced both HYV Wheat and Aus, as a result of which total gross cropped area and hence cropping intensity has been much less than what been targetted for. However, cultivation of profitable crop in one season while keeping the land grossly underutilized in the other two seasons may not generate sufficient farm income to meet the needs of the households. The lower farm income per household derived from crop production in the control area, as we observed earlier, testify to this.

The findings may be summarised as follows:

(a) Changes in cultivated area

(1) A 4 per cent increase in Aus compared with control but 29 per cent decrease compared with pre-project situation (and 40 per cent decrease compared with target).

(2) About 50 per cent increase in Aman compared with control, but only about 18 per cent increase compared with pre-project situation (and 27 per cent increase compared with target).

(3) About 8 per cent decrease in Boro/Rabi compared with control but about 34 per cent increase compared with pre-project situation (and 6 per cent decrease compared with the target).

(b) Changes in cropping pattern

(1) No changes in HYV Aus compared with either control or pre-project situation.

(2) Significant increase in HYV Aman compared to both control and pre-Project situation.

(3) Significant shift to HYV Boro from B. Aus compared with pre-project situation.

(c) Changes in cropping intensity

(1) Significant increase (from 125 per cent to 180 per cent) compared with the control area.

(2) Marginal increases (from 175 per cent to 180 per cent) compared with the pre-project intensity.

(3) Significant shortfall (from 221 per cent to 180 per cent) compared with the target intensity.

(d) Changes in paddy yield

(1) Positive changes (from 1.03 Mt/ha to 1.91 Mt/ha) for Local Aman and negative changes for HYV Boro (from 6.66 Mt/ha to 5.83 Mt ha) compared with control area.

(2) Positive changes for Local Aman (from 1.49 Mt/ha to 1.91 Mt/ha), HYV Aman (from 2.74 Mt/ha 4.06 Mt/ha), HYV Boro (from 3.20 Mt/ha to 5.83 Mt/ha), and also all paddy (from 1.67 Mt/ha to 3.69 Mt/ha) compared with pre-project situation.

(e) Changes in paddy output (incremental)

(1) Increase in annual paddy output by 10,666 tons compared with the pre-project situation, and exceeds the target output by 4132 tons i.e. by 31 per cent.

5.5 Other Agriculture: Livestock, Forestry and Fisheries

Most of the households in the Project area are engaged in farming activities and as such crop production constitute their main occupation. However, it is to be recognised that non-crop agricultural activities such as livestock, forestry and fisheries are integral parts of the farming system. The farm households are almost entirely dependent on draught power derived from livestock, which also constitute important sources of animal products and cash income. Important animals in the Project area are cattle, goats, lambs, chicken and ducks, with a few buffaloes.

Fish is an essential item of food and is the major source of animal protein in rural Bangladesh. Fisheries in the Project area mainly involve capture fisheries from the rivers and other water bodies. Although there is hardly any professional fisherman among the sample households, almost all households engaged in fishing during the monsoon and in other periods when crop activities are not demanding.

Forests are an important source of fuel, fibre and timber. Also, forests maintain ecological balance by their beneficial effects on water catchment areas, soil conservation, control of siltation of dams and canals. In the Project area, there is no land exclusively devoted to forestry. Homestead and village forestry are the major source of forests products, which mainly consists of fruit trees and some commercial species.

It may be emphasized here that while formulating the Project, no explicit plans or programmes related to livestock, forestry and fisheries development were envisaged. However, the intensification of crop production activities in the Project area as well as the Project structures could have considerable impact on

these resources. For example, protection from floods and improved drainage conditions lead to changes in the cropped area in different cropping seasons, which may ultimately cause changes in drought power requirements for land preparation in the Project area. It is extremely doubtful whether the Project has considered as how to meet the increased requirements of draught power for timely land preparation and other crop related activities if the Project targets were to be achieved.

Moreover, although the Project does not have any direct impact on livestock production, the increase in cropped area could lead to reduction in fallow land and grazing area for livestock, and have effects on livestock feed resources. For fisheries, the construction of embankment and other structures are expected to lead to a decline in open water capture fisheries with adverse consequences on income and nutritional status of the farm households in the Project area.

The post-project changes in livestock, forestry and fisheries are summarised below in Table 5.15. It is readily observed that more than 70 per cent of the villages have experienced a decline in the number of cattle with decrease in the pasture/grazing land and supply of animal feed. In almost all the villages (15 out of 17 village surveyed), area of waterbodies and hence opportunity for capture fisheries has declined. This could be directly attributed to the Project structure, particularly the construction of embankment in the area. The impact on forestry resources, on the other hand, is positive though not very pronounced.

In general, therefore, one gets the impression that there has been considerable negative impact on the pasture/grazing area and availability of animal feed, and hence the supply of livestock, particularly cattle in the Project area. Similar is the case with open water capture fisheries, which also registered a decline following the construction of embankment and other project structures, presumably due to reduction in water bodies and blocking of fish migration routes. What is more significant, there is no evidence of any attempt to compensate for this loss through promotion of culture fisheries in the Project area.

Table 5.15

Post-Project Changes in Livestock, Forestry and Fisheries

Indicators		Percentage of Village Reporting		
		Increase	Decrease	No Change
1.	No. of Cattle	5.9	70.6	23.5
2.	No. of Buffaloes	29.4	52.9	17.6
3.	No. of Goats	70.6	5.9	23.5
4.	No. of Sheep	41.2	5.9	47.1
5.	No. of Ducks	41.2	41.2	17.6
6.	No. of Chicken	70.6	0.0	29.4
7.	Pasture/Grazing Area	11.8	88.2	0.0
8.	Supply of Animal Feed	29.4	64.7	5.9
9.	Area of Waterbodies	11.8	88.2	0.0
10.	Opportunities for Capture Fishery	0.0	100.0	0.0
11.	Stock of Fruit Trees	64.7	29.4	5.9
12.	Stock of Commercial Trees	52.9	41.2	5.9

Source: BIDS/SSISP Village Level Survey (1992).

CHAPTER 6

LAND, CREDIT AND LABOUR MARKETS

6.1 Distribution of Land Holdings

In an agrarian economy characterised by low land/man ratio, land is the most important asset which critically determines the access to other resources. Table 6.1 shows distribution of land holdings among various farm-size classes for both owned and operated land in the project and the control area.

Table 6.1

Distribution of Owned and Operated Land by Size Classes

Size Class (ha)	Project			Control		
	Percentage of households	Percentage of area		Percentage of households	Percentage of area	
		Owned	Operated		Owned	Operated
0.00	45.78	0	0.70	20.00	0	0
0.01-0.20	13.25	2.62	4.74	-	-	-
0.21-0.40	10.84	6.85	7.48	16.00	7.66	17.11
0.41-1.01	15.66	21.83	24.93	44.00	38.58	46.91
1.02-2.02	6.32	17.36	18.49	12.00	17.89	10.15
2.03-3.02	3.61	16.21	14.67	-	-	-
3.03 & above	4.82	35.14	28.99	8.00	35.88	23.83
Total	100.00	100.00	100.00	100.00	100.00	100.00
Gini Co-efficient		0.75	0.70		0.49	0.31

Source: BIDS/SSISP Household Survey 1992.

It is observed that land distribution in both the project and control areas are highly unequal. Seventy per cent of the households at the bottom of the distribution in the project area own only about 10 per cent of the land area. The Gini coefficient of land concentration is computed to be 0.75 for owned and 0.70 for operated land respectively. The land distribution in the control area is observed to be less unequal. Thirty-six per cent of the households at the bottom of the land distribution own about 8 per cent of the land area, and operated about 17 per cent of the area. The Gini coefficients for owned land and operated land are computed to be 0.49 and 0.31 respectively in the control area. Almost 45 per cent of the households in the project area and 20 per cent in the control area do not own any land at all.

6.2 Land Fragmentation and Irrigation Status

Most of the cultivable land is fragmented into tiny plots with average size of 0.20 hectare in the project area and of 0.28 hectare in the control area (Table 6.2). The average number of plots per household is 2.73 and 4.64 for project and control areas respectively. About 40 per cent of the households irrigate their land in the project area, compared to 80 per cent in the control area.

6.3 Tenurial Practices

The tenurial status of the sample households are presented in Table 6.3. In the project area, owner-cultivators (69 per cent) is the dominating form of tenancy, followed by owner-cum-tenants (27 per cent). The reverse is true in the control area, where the majority of the farm-households are owner-cum-tenants (63 per cent), followed by owner-cultivators (38 per cent). Hardly any pure tenancy is observed either in the project or in the control area. Landless farmers with no land of their own are not generally preferred as cultivators by the land owners due to their meagre investible resources to carry on the agricultural operations.

The distribution of rented-in and rented-out land by farm size categories is presented in Table 6.4. It is observed that for all farm sizes, 17 and 13 per cent of the households in the project area are engaged in renting-in and renting-out activities respectively. These figures are 40 and 48 per cent respectively in the control area. Thus, the land lease market seems to be more

Table 6.2

Land Fragmentation and Irrigation Status by Plots

Farm Size (ha)	No. of plots per household	Average size of plots (ha)	Percentage of households using irrigation	Percentage of irrigated plots in total plots	Percentage of irrigated area	Irrigated area per household (ha)
PROJECT AREA						
0.00-0.20	0.47	0.09	8.16	26.09	36.05	0.02 (3.64)
0.21-1.01	4.86	0.13	86.36	44.86	50.27	0.31 (32.75)
1.02-2.02	7.00	0.22	100.00	62.86	73.03	1.13 (26.96)
2.03 & above	8.14	0.38	71.43	33.33	35.43	1.09 (36.65)
All farms	2.73	0.20	39.76	42.79	46.42	0.25 (100.00)
CONTROL AREA						
0.00-0.20	-	-	-	-	-	-
0.21-1.01	5.00	0.21	100.00	73.33	77.06	0.81 (58.53)
1.02-2.02	6.33	0.24	100.00	57.89	72.64	1.11 (15.96)
2.03 & above	11.00	0.32	100.00	63.64	75.50	2.66 (25.51)
All farms	4.64	0.28	80.00	68.97	75.92	0.83 (100.00)

Note : Figures in parentheses indicate the percentage share in total irrigated area.

Source: BIDS/SSISP Household Survey 1992.

Table 6.3

Tenurial Status of Sample Households by Farm Size Categories

Farm Size (ha)	Percentage of	Project			Control		
		Owner	Owner-cum-tenant*	Tenants	Owner	Owner-cum-tenant*	Tenants
0.00-0.20	Household :	61.54	23.08	15.98	-	-	-
	Farm area :	32.35	54.89 (1.12)	12.75	-	-	-
0.21-1.01	Household :	66.67	33.33	-	30.77	69.23	-
	Farm area :	63.30	36.70 (4.54)	-	14.50	85.50	-
1.02-2.02	Household :	80.00	20.00	-	-	100.00	-
	Farm area :	77.70	22.31 (1.57)	-	-	100.00	-
2.03 & above	Household :	83.33	16.67	-	100.00	-	-
	Farm area :	78.72	21.28 (3.56)	-	100.00	-	-
All Farms	Household :	68.89	26.67	4.44	37.50	62.50	-
	Farm area :	71.06	28.25 (10.79)	0.68	35.11	65.50	-

* The figures in parentheses indicate the percentage of owned area.

Source: BIDS/SSISP Household Survey 1992.

Table 6.4

Distribution of Rented-in and Rented-out Land by Farm Size Categories

Farm Size (ha)	Project						Control					
	Rented-in			Rented-out			Rented-in			Rented-out		
	Area (ha)	% of household	% of land	Area (ha)	% of household	% of land	Area (ha)	% of household	% of land	Area (ha)	% of household	% of land
0.00 - 0.20	0.97	10.20	29.85	-	-	-	-	-	-	-	-	-
0.21 - 1.01	1.64	31.82	50.46	1.33	27.27	19.44	6.74	60.00	86.30	2.35	53.33	36.83
1.02 - 2.02	0.47	20.00	14.46	0.63	40.00	9.21	1.07	33.33	13.70	2.43	66.67	38.09
2.03 & above	0.17	14.29	5.23	4.88	42.86	71.35	-	-	-	1.60	100.00	25.08
All farms	3.25	16.87	100.00	6.84	13.25	100.00	7.84	40.00	100.00	6.38	48.00	100.00

Source: BIDS/SSISP Household Survey 1992.

active in the control area. In the project area, as expected. the large farm households are the largest contributor to renting-out land and these households are involved only marginally in renting-in land. In the control area, on the other hand, while the renting-in activities is limited only to medium farm groups, in renting-out activities the large farm group is also involved, though less prominently. Moreover, the two medium sized groups together account for about 67 and 100 per cent of rented-in land in the project and control areas respectively. For rented-out land, such percentages are 28 per cent and 75 per cent respectively.

The nature of land as well as terms of leasing of land are presented in Table 6.5. It is readily observed that share-cropping is the only mode of renting-out of land prevalent in both the project and the control area and this involves mostly irrigated land. However, in case of rented-in land, various forms of leasing through which the process of transfer of operational rights takes place

Table 6.5

Nature and Terms of Leasing of Land by Farm Size

A. RENTING-OUT LAND

Farm size (ha)	Project			Control		
	Share-cropped (ha)*			Share-cropped (ha)*		
	Irrigated	Non-irrigated	Total	Irrigated	Non-irrigated	Total
0.00 - 0.20	-	-	-	-	-	-
0.21 - 1.01	0.90	-	0.90	1.59	0.07	1.62
1.02 - 2.02	0.36	0.27	0.63	1.46	0.98	2.44
2.03 & above	2.19	-	2.19	0.80	0.81	1.61
All farms	3.45	0.27	3.72	3.85	1.86	5.71

* No other form of renting-out practice was reported

B. RENTED-IN LAND

(in ha)

Farm Size (ha)	Project								Control							
	Share cropped		Fixed Rent		Mortgaged		Total		Share cropped		Fixed Rent		Mortgaged		Total	
	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated
0.00 - 0.20	0.52	0.11	-	0.16	-	0.20	0.52	0.47	-	-	-	-	-	-	-	-
0.21 - 1.01	0.27	0.62	-	-	0.07	0.10	0.34	0.72	0.83	2.49	-	-	0	0.21	1.04	2.49
1.02 - 2.02	0.47	-	-	-	-	-	0.46	-	1.07	-	-	-	-	-	1.07	-
2.03 & above	0.17	-	-	-	-	-	0.17	-	-	-	-	-	-	-	-	-
All farms	1.43	0.73	-	0.16	0.07	0.30	1.50	1.19	1.90	2.49	-	-	0	0.21	2.11	2.49

* No other form of renting-in practice was reported

Source: BIDS/SSISP Household Survey 1992.

seem to be in practice. Nevertheless, sharecropping still emerges as the dominant mode in both the project and control villages.

Table 6.6 shows that even in case of share-cropping, alternative systems are practised, particularly in the project area. For cultivation of local rice, the most predominant system involves the owner receiving the half of the crop output without paying for any input costs. Incidentaliy, this is the only reported system for cultivation of local rice in the control area. In case of HYV rice, the only reported system is the one where the owners receive one-third of the crop without sharing any input costs in the control area. This system is widely prevalent for HYV rice in the project area as well, although another system where owner receives half of the crop after paying half of the input costs is also practised.

Table 6.6

Systems of Share-Cropping Practised in Project and Control Areas

System of Share-cropping	Project		Control	
	Percentage of Villages Practised for cultivation of		Percentage of Villages Practised for cultivation of	
	Local rice	HYV Rice	Local rice	HYV Rice
I	82.4	-	100.0	-
II	5.9	29.4	-	-
III	-	52.9	-	100.0
IV	11.8	17.6	-	-

Note : I : Owner receives half of the crop without sharing any input costs
II : Owner receives half of the crop after sharing half of input costs
III : Owner receives one third of the crop without paying input costs
IV : Others

Source: BIDS/SSISP Village Level Survey 1992.

6.4 Land Transactions

Since land is practically the only productive asset at the disposal of the farm households on which their livelihood security depends, they would resort to selling of land only under conditions of extreme duress, and when no other alternatives exist. In fact, changes in the land market taken place more in terms of temporary leasing of operational rights than in terms of permanent transfer involving sale and purchase of land. In fact, the outright sale and purchase of land is very limited in rural Bangladesh.

Table 6.7 provides information on land transactions over a period of five years in both the project and the control area. It is readily observed that land transactions - both sale and purchase-is more frequent in the project area than in the control area. Also, land purchases have considerably increased in the project area in recent years.

Table 6.7

Land Transactions in the Project and Control Areas

Year	Project				Control			
	% of households involved		Total area (ha)		% of households involved		Total area (ha)	
	Pur-chase	Sale	Pur-chase	Sale	Pur-chase	Sale	Pur-chase	Sale
1394	3.6	2.4	0.45	0.91	-	-	-	-
1395	2.4	2.4	0.11	0.26	-	-	-	-
1396	6.0	7.2	1.21	1.04	8.00	4.00	0.27	0.40
1397	8.4	2.4	1.06	0.40	-	4.00	-	0.16
1398	14.5	6.0	1.46	0.68	12.00	4.00	0.52	0.27

Source: BIDS/SSISP Household Survey, 1992.

Whether and to what extent such increase in land purchase can be attributed to project intervention is not very clear, but it seems plausible that the expectation of the farm-households regarding productivity increases, and consequent rise in land prices following the project implementation may have induced them to invest in land purchases.

6.5 Land Prices

Table 6.8 indicates that not only the absolute prices of all categories of land are much higher, but land prices have also increased more in the project area as compared to the control area. This is possibly due to more frequent transactions and also expected productivity gains perceived by people in the project area.

Table 6.8

Land Price in the Project and the Control Area

(Tk/ha)

Type of land	Project			Control		
	Present	Pre-project	% change	Present	Pre-project	% change
Irrigable	194.694	115.945	67.92	98.800	59.280	66.67
Non-irrigable	192,028	101.561	89.08	74.100	44.460	66.67
Homestead	273,153	160.405	70.29	118,560	88.920	33.33

Source: BIDS/SSISP Village Level Survey, 1992.

6.6 Credit

Table 6.9 presents information on the sources of borrowing in both the project and the control area. Credit is an important input in agricultural production, whose demand is likely to increase with the dissemination of modern technology. The survey reveals that about 39 per cent of the households borrowed in the project area as compared to only 20 per cent in the control

Table 6.9

Sources of Credit by Farm Size Categories in the Project and the Control Area

(Tk) % of Farm size (ha)	Percentage of households taking loan from				Average size of loan (Tk)		
	Institutional sources	Non-institutional sources	Both sources	Total	Institutional sources	Non-institutional sources	Total
PROJECT AREA							
0.00-0.20	12.2	28.6	4.1	44.9	2188	4043	6231
0.21-1.01	-	22.7	-	22.7	-	2600	2600
1.02-2.02	20.0	20.0	20.0	60.0	3500	3500	7000
2.03 & above	-	28.6	-	28.6	-	6000	6000
All farms	8.4	26.5	3.6	38.5	2450	3867	6317
CONTROL AREA							
0.00-0.20	-	20.0	-	20.0	-	2000	2000
0.21-1.01	-	26.7	-	26.7	-	2730	2730
1.02-2.02	-	-	-	-	-	-	-
2.03 & above	-	-	-	-	-	-	-
All farms	-	20.0	-	20.0	-	2600	2600

Note: The average size of loan are computed for these households who actually borrowed.

Source: BIDS/SSISP Household Survey 1992.

area. The contribution of institutional sources is observed to be very low - only about 8 per cent in the project area and none in the control area. Thus, non-institutional sources clearly predominate, both in terms of coverage and the

amount of loan. This is more so in the control area where the farmers do not seem to have any access to institutional sources of credit. In the project area, all classes of farmers borrowed from non-institutional sources, while in the control area, the borrowing seem to restricted to the smaller groups.

Table 6.10 provides information on the uses of credit derived from both institutional and non-institutional sources for productive and non-productive purposes in both the project and the control area. In the project area, nearly two-third of the total institutional credit are used for productive purposes with almost equal share between agricultural and non-agricultural activities. The rest, one-third, are used for non-productive purposes. The use of credit for productive purposes, (with non-agricultural activities dominating) is also pronounced in case of the fund borrowed from non-institutional sources. In the control area, the credit solely derived from non-institutional sources are mostly used in agricultural productive activities.

6.7 Labour Market and Employment

The impact on the labour market is expected to occur through an increase in labour demand due to intensification of agricultural activity following the implementation of the project. However, labour market in the project area may not be isolated, and inter-area mobility of labour may weaken the project impact.

6.7.1 Participation Rate and Employment

Table 6.11 shows the participation rate and average number of earners per household for the project and the control area. It is observed that female participation rate is quite low, particularly in the project area. Both male and female participation rates are higher in the control areas compared to the project area. The average number of earners is very similar in the two areas casting doubt whether the project contributed towards expansion of earning opportunities.

Table 6.12 provides information on the number of days of employment during the year in which survey was carried out. It is observed that the heads of the household worked for 327 days in the project area compared to the 309 days in the control area during the year. Similarly, for all working members

Table 6.10

Uses of Credit by Farm Size Categories in the Project and Control Area

Uses of Credit	Percentage distribution in each size group				
	Farm Size (ha)				
	0.0-0.20	0.21-1.01	1.02-2.02	2.03 and above	All farms
PROJECT AREA					
Institutional Credit					
(a) Ag. productive activities	8.57	-	100.00	-	34.69
(b) Non-ag. productive activities	45.71	-	-	-	32.65
(c) Non-productive purpose	45.71	-	-	-	32.65
Total	100.00	-	100.00	-	100.00
Non-Institutional Credit					
(a) Ag. productive activities	6.18	75.00	57.14	66.67	26.63
(b) Non-ag. productive activities	64.94	-	42.86	-	46.55
(c) Non-productive purpose	28.88	25.00	-	33.33	26.82
Total	100.00	100.00	100.00	100.00	100.00
CONTROL AREA					
Institutional Credit					
(a) Ag. productive activities	-	-	-	-	-
(b) Non-ag. productive activities	-	-	-	-	-
(c) Non-productive purpose	-	-	-	-	-
Total	-	-	-	-	-
Non-Institutional Credit					
(a) Ag. productive activities	-	81.82	-	-	69.23
(b) Non-ag. productive activities	-	18.18	-	-	15.38
(c) Non-productive purpose	100.00	-	-	-	15.38
Total	100.00	100.00	-	-	100.00

Source: BIDS/SSISP Household Survey, 1992.

Table 6.11

Participation Rate and Average Number of Earners

Farm size (ha)	Project						Control					
	Participation rate(%)			Earner per household (No.)			Participation rate (%)			Earner per household (No.)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0.00 - 0.20	78.2	7.3	41.0	1.4	0.1	1.5	88.9	23.0	58.8	1.6	0.4	2.0
0.21 - 1.01	69.4	2.2	40.7	2.0	0	2.0	86.2	0	51.0	1.7	0	1.7
1.02 - 2.02	53.3	0	29.6	1.6	0	1.6	75.0	20.0	44.4	1.0	0.3	1.3
2.03 & above	72.2	0	34.2	1.9	0	1.9	50.0	12.5	28.6	1.5	0.5	2.0
All farms	72.5	4.6	39.3	1.6	0.1	1.7	81.3	9.8	48.3	1.6	0.2	1.8

Source: BIDS/SSISP Household Survey 1992.

Table 6.12

Average Number of Days of Employment during the Survey Year

Farm Size (ha)	Project Area						Control Area					
	Household Head			All Members			Household Head			All Members		
	Agri-culture	Non-Agri-culture	Total	Agri-culture	Non-Agri-culture	Total	Agri-culture	Non-Agri-culture	Total	Agri-culture	Non-Agri-culture	Total
0.00 - 0.20	76	251	327	79	245	324	152	123	275	141	136	277
0.21 - 1.01	198	134	332	195	125	320	253	67	320	233	83	316
1.02 - 2.02	213	126	339	198	122	320	120	180	300	80	219	299
2.03 & above	277	20	297	227	77	304	24	336	360	130	204	334
All farms	131	196	327	129	192	321	206	103	309	186	120	306

Source: BIDS/SSISP Household Survey 1992.

taken together, the number of days worked are also higher in the project area. However, this is due to the greater working opportunities in non-agricultural activities in the project area as reflected in the greater number of days devoted to such activities, which more than offset the shortfall in agricultural employment.

Information about seasonal pattern of employment (average days of employment per month) in both the project and the control area for heads of households as well as for all member of the households are presented in Table 6.13 and Table 6.14 respectively. The pattern of agricultural employment reflect the seasonality in crop activities with Bhadra, Aswin and Kartik representing the slack periods. The seasonality is more pronounced in the control area, where Ashar and Shraban are also characterised by slack activity. This seasonality is also captured in the coefficients of variation of monthly employment, the coefficients for agricultural employment is generally higher than those for non-agricultural employment. Moreover, it in observed that the estimated coefficient of variation of total employment is much smaller than that of agricultural employment thereby indicating that monthly pattern of agricultural and non-agricultural employment tend to counteract each other.

A comparison of the monthly unemployment rates between the pre- and post-project periods are made in the project area in Table 6.15. It is observed that the percentage of villages having more than 30.0 per cent unemployment rates have declined in most months of the year during the post-project period as compared to the pre-project situation. This implies that there could have been some positive impact of project activities on the employment situation in the area.

6.7.2 Wage Rates

The average monthly wage rates during the pre- and post-project periods in both the project and the control area are presented in Table 6.16. It is

Table 6.13

Monthly Distribution of Employment for Household Heads in the Project and Control Area

Months	Average Days of Employment in				
	Agricultural self-employment	Agricultural wage-employment	Non-agricultural self employment	Non-agricultural wage employment	Total
PROJECT AREA					
Baishakh	8.4	3.4	8.8	8.2	28.8
Jaistha	7.9	3.7	8.6	7.7	27.9
Ashar	7.5	3.3	9.0	6.2	26.1
Shraban	7.2	3.0	8.9	6.0	25.2
Bhadra	6.3	2.5	8.8	6.1	23.6
Ashwin	5.7	2.7	9.0	6.1	23.6
Kartik	6.4	3.8	8.8	6.7	25.8
Agrahayan	8.3	4.0	8.7	6.9	28.1
Poush	7.9	3.4	9.1	7.5	27.9
Magh	8.1	2.9	9.0	7.8	27.9
Falgun	7.8	3.3	8.7	7.6	27.5
Chaitra	7.8	3.3	9.1	8.1	28.3
Average	7.4	3.3	8.9	7.1	26.7
Coefficient of variation	11.1	13.0	1.8	11.3	6.5
CONTROL AREA					
Baishakh	14.5	5.6	5.0	4.3	29.3
Jaistha	11.9	5.6	4.8	5.7	28.0
Ashar	8.1	2.6	4.0	7.1	21.8
Shraban	7.4	2.1	4.2	6.4	20.1
Bhadra	6.7	1.7	4.4	6.8	19.5
Ashwin	6.9	2.2	5.2	6.8	21.1
Kartik	10.2	3.7	4.9	4.9	23.8
Agrahayan	13.8	4.7	4.8	4.1	27.4
Poush	14.0	5.1	4.6	4.7	28.5
Magh	14.6	4.7	4.7	4.4	28.4
Falgun	14.1	5.4	4.7	4.3	28.6
Chaitra	15.1	5.4	4.8	4.1	29.4
Average	11.4	4.1	4.7	5.3	25.5
Coefficient of variation	28.1	35.8	6.9	21.3	14.7

Source: BIDS/SSISP Household Survey 1992.

Table 6.14

Agricultural and Non-Agricultural Employment (all working members) in the Project and Control Area

Months	Average Days of Employment in					
	Project Area			Control Area		
	Agricultural employment	Non-Agricultural employment	Total	Agricultural employment	Non-Agricultural employment	Total
Baishakh	11.8	17.0	28.8	20.1	9.2	29.3
Jaishtha	11.6	16.3	27.9	17.5	10.5	28.0
Ashar	10.8	15.3	26.1	10.7	11.1	21.8
Shraban	10.2	15.0	25.2	9.5	10.6	20.1
Bhadra	8.5	15.1	23.6	8.4	11.1	19.5
Ashwin	8.4	15.2	23.6	9.1	12.0	21.1
Kartik	10.2	15.6	25.8	13.9	9.9	23.8
Agrahayan	12.3	15.8	28.1	18.5	8.9	27.4
Poush	11.3	16.6	27.9	19.1	9.4	28.5
Magh	11.0	16.9	27.9	19.3	8.9	28.4
Falgun	11.1	16.4	27.5	19.5	9.1	28.6
Chaitra	11.1	17.2	28.3	20.5	8.9	29.4
Monthly average	10.7	16.0	26.7	15.5	10.0	25.5
Coefficient of variation	10.8	4.8	6.5	29.8	10.2	14.7

Source: BIDS/SSISP Household Survey 1992.

Table 6.15

Monthly Unemployment Rates in the Project Area During Pre- and Post-Project Situation

Month	Percentage of villages with unemployment rates			
	0.0 to 30.0 per cent		30.1 per cent and above	
	Post-project	Pre-project	Post-project	Pre-project
Baishakh	100.0	88.2	0	11.8
Jaistha	100.0	82.4	0	17.6
Ashar	88.2	82.4	11.8	17.6
Shraban	70.6	58.8	29.4	47.2
Bnadra	53.0	58.8	47.1	41.2
Ashwin	82.3	29.4	52.9	70.6
Kartik	82.4	29.4	17.6	70.6
Agrahayan	100.0	100.0	0	0
Poush	100.0	88.2	0	11.8
Magh	100.0	88.2	0	11.8
Falgun	94.1	70.6	5.9	29.4
Chaitra	94.1	88.2	5.9	11.8

Source: BIDS/SSISP Village Level Survey 1992.

Table 6.16

Average Daily Wage Rates by Months: Pre and Post-Project Periods

Month	Project Area			Control Area		
	Post-project	Pre-project	% change	Post-project	Pre-project	% change
Baishakh	41	24	71	50	30	67
Jaistha	41	24	71	40	20	100
Ashar	39	23	70	30	20	50
Shraban	35	22	59	30	20	50
Bhadra	33	20	65	25	15	67
Ashwin	31	18	72	25	15	67
Kartik	34	19	79	30	20	50
Agrahayan	41	24	71	35	25	40
Poush	39	25	56	40	30	33
Magh	39	24	63	45	35	29
Falgun	37	22	77	35	30	17
Chaitra	37	22	68	30	25	20
Average wage rate	37	22	68	35	24	46
coefficient of variation	8.7	9.6	-	21.7	26.0	-

Source: BIDS/SSISP Village Level Survey 1992.

observed that although during the pre-project situation the average wage rates, in general were higher in the control area, the reverse in true in the post-project period. This is because the average wage rates have increased at a faster rate in the project area following the implementation of the project. The increased employment generated due to intensification of agricultural operations seem to have created some upward pressures on wage rates in the project area.

CHAPTER 7

IMPACT ON EDUCATION, HEALTH AND NUTRITION

7.1 Educational Characteristics

The educational status of the heads of households in both the project and the control area are shown in Table 7.1. The average rate of literacy of the heads of households seen to be quite high -- much above national average -- in both the project (57 per cent) and the control area (71 per cent). However, not only the average rate of literacy but the level of educational attainment (those with secondary, SSC and above) is higher in the control area (36 per cent) as compared to the project area (24 per cent).

Table 7.1

Educational Status of the Heads of Households

(in per cent)

Farm Size (ha)	Project						Control					
	Illiterates	Literates					Illiterates	Literates				
		Total	Below primary	Primary	Secondary	SSC & above		Total	Below primary	Primary	Secondary	SSC & above
0.00 - 0.20	46.9	53.1	16.3	22.4	12.2	2.0	80.0	20.0	-	20.0	-	-
0.21 - 1.01	45.5	54.5	13.6	9.1	22.7	9.1	13.3	86.7	26.7	26.7	20.0	13.3
1.02 - 2.02	20.0	80.0	40.0	-	20.0	20.0	33.3	66.7	-	-	33.3	33.3
2.03 & above	28.6	71.4	14.3	-	28.6	28.6	-	100.0	-	-	50.0	50.0
All farms	43.4	56.6	16.9	15.7	16.9	7.2	28.0	72.0	16.0	20.0	20.0	16.0

Source: BIDS/SSISP Household Survey 1992.

The conclusion remains valid when we consider the literacy of all members of the households (population of 5 years and above) (Table 7.2) and current enrollment rate (Table 7.3). Table 7.2 shows that the average rate of literacy is 76 per cent among the household members in the control area as compared to those of 57 per cent in the project area. The level of educational attainment (those with 6th grade, SSC and above) of all members of the households also higher in the control area (30 per cent) as compared to the project area (15 per cent). The rate of literacy seem to be positively correlated with the farm size. This is true in both the project and the control area.

Table 7.2

Educational Status of All Members (5 Years and Above) of Households

(in per cent)

Farm Size (ha)	Project						Control					
	Illiterates	Literates					Illiterates	Literates				
		Total	Below primary	Primary	Secondary	SSC & above		Total	Below primary	Primary	Secondary	SSC & above
0.00 - 0.20	49.4	50.6	28.6	13.7	7.5	0.8	57.1	42.4	32.1	7.1	3.6	-
0.21 - 1.01	44.2	55.8	18.6	15.5	14.7	7.0	17.9	82.1	31.3	20.9	22.4	7.5
1.02 - 2.02	22.9	77.1	37.1	25.7	11.4	2.9	8.9	91.1	33.3	16.7	16.7	25.0
2.03 & above	23.9	76.1	19.6	17.4	17.4	21.7	-	100.0	-	21.4	21.4	57.1
All farms	**43.2**	**56.8**	**25.5**	**15.5**	**10.9**	**4.9**	**24.0**	**76.0**	**28.1**	**17.4**	**17.4**	**13.2**

Source: BIDS/SSISP Household Survey 1992.

Table 7.3

School Enrollment Rate of Children in the Project and Control Areas

Farm Size (ha)	Project			Control		
	Boys	Girls	Total	Boys	Girls	Total
0.00 - 0.20	54.2	81.0	66.7	66.7	50.0	55.6
0.21 - 1.01	40.0	75.0	55.6	83.3	80.0	81.3
1.02 - 2.02	71.4	0.0	71.4	100.0	100.0	100.0
2.03 & above	0.0	100.0	100.0	0.0	0.0	0.0
All farms	53.7	82.4	66.7	80.0	72.2	75.0

Source: BIDS/SSISP Household Survey 1992.

The school enrollment rates of children in both the project and control area are shown in Table 7.3. The control area households (80 per cent) are observed to have a higher proportion of children attending school than in the households in the project area (67 per cent). This is true for boys but not for girls. One can not attribute any project related differences in overall education attainment in the sample.

7.2 Impact on Health

The Baranai project did not envisage any improvement in health status of the population in the area. However, one would expect that with the increase in income and the general improvement in socio-economic conditions would exert a positive influence on health condition in the project area.

Given the limited scope of this study, no comprehensive analysis of the changes in health-related variables has been attempted here. Moreover, there is difficulty in attributing such changes to project-related intervention. Table 7.4 presents a summary of the post-project changes in the incidence of disease in the Baranai project area. It is observed that stomach related diseases has registered an increase in their incidence in the majority of villages. This may

Table 7.4

Post-Project Changes in the Incidence of Diseases

Name of Disease	Percentage of villages reporting		
	Increase	No change	Decrease
Malaria	-	17.6	82.4
Diarrhoea	52.9	5.9	41.2
Stomach & abdominal pains	68.8	12.5	18.8
Stomach problems	58.8	29.4	11.8
Cough and catarrhal problem	-	64.7	35.3
Pneumonia	-	46.7	53.3
Typhoid	-	56.3	43.8
Rheumatism	18.8	62.5	18.8
General fever	5.9	70.6	23.5

Source: BIDS/SSISP Village Level Survey 1992.

be traced, at least partially, to the increase in water logging, accumulation of water hyacinth and other water related problems caused by the project. However, the incidence of rest of the diseases investigated such as cough and related problems, typhoid, rheumatism, general fever, pneumonia and malaria has either remained static or decreased in the majority of villages surveyed.

7.3 Food Intake and Nutrition

One of the basic objectives of project intervention is to boost up agricultural production and income thereby leading to higher food consumption and better nutritional levels in the households. No full-fledged nutritional survey could be undertaken given the limited scope of this study. However,

some indication on the level of food intake and nutritional status are provided in order to ascertain their adequacy and trends in the sample households.

Table 7.5 provides information on the number of times certain major food items were consumed during the week of the survey in both the project and control areas. It is observed that during the period of the study week, the major sources of animal protein such as meat and milk were not consumed at all by 88

Table 7.5

Frequency of Consumption of Certain Major Food Items During a Period of 7 Days

(per cent of household)

Frequency	Project					Control				
	Fish	Meat	Milk	Lentil	Vege-table	Fish	Meat	Milk	Lentil	Vege-table
Zero	21.7	88.0	47.0	8.4	-	40.0	80.0	52.0	8.0	-
One	20.5	4.8	8.4	14.5	1.2	36.0	12.0	4.0	8.0	-
Two	22.9	4.8	1.2	22.9	2.4	4.0	8.0	8.0	36.0	-
Three	14.5	2.4	1.2	20.5	2.4	8.0	-	4.0	-	-
Four	8.4	-	2.4	12.0	13.3	8.0	-	4.0	24.0	12.0
Five & more	12.0	-	39.8	21.7	80.7	4.0	-	28.0	24.0	88.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: BIDS/SSISP Household Survey 1992.

and 47 per cent of the households respectively in the project area. The situation is no better in the control areas where the corresponding figures are 80 and 52 per cent respectively. Moreover, 40 per cent of the housenolds did

not consume fish at all in the control area. The project area fared better in this respect since most of the households (78 per cent) consumed fish at least once during the week. In case of lentil, one of the major sources of vegetable protein the situation is far better in both the areas with only about 8 per cent of the households reporting no consumption during the week in which the survey was undertaken. Also, the intake of vegetables would seem to be quite high with 81 and 88 per cent of the households in the project and control area respectively reporting consumption five times or more during the week.

The consumption of cereals dominates food consumption in the rural areas with rice and wheat contributing more than 80 per cent of total calorie intake of the households. Table 7.6 shows that the average consumption of cereals is higher in the control area than in the project area. The higher per capita intake of rice by the households in the control area more than offset the shortfall in respect of atta and other minor cereals.

Table 7.6

Per Capita Average Consumption of Cereals

(average of 7 days in Kg)

Farm Size (ha)	Project				Control			
	Rice	Atta	Other Cereals	Total	Rice	Atta	Other Cereals	Total
0.00 - 0.20	3.14	0.50	0.05	3.69	3.57	-	-	3.57
0.21 - 1.01	3.30	0.41	0.02	3.73	3.84	-	-	3.84
1.02 - 2.02	3.37	0.62	0.11	4.10	5.82	-	0.05	5.87
2.03 & above	4.18	0.44	0.19	4.81	4.94	0.11	-	5.05
All farms	3.28	0.48	0.06	3.82	4.11	0.01	0.01	4.13

Source: BIDS/SSISP Household Survey 1992.

The trends in the level of consumption are shown in Table 7.7, which reports the percentage of households in the project and the control area indicating the nature of changes, compared to the pre-project situation. It is observed that except in case of homestead vegetables, few of the households reported increases in the levels of consumption of major food items. This is particularly pronounced among the households in the control area. In case of a decline, a very large proportion of the households in both the areas (71 per cent in the project area and 96 per cent in the control area) has reported the case of fish. In case of rice, the staple food, 70 per cent of the households in the project area have reported no change, while about 5 per cent have reported a decline in consumption. The situation in the control area is somewhat worse, with 88 per cent reporting no change and 8 per cent reporting a decline in consumption. On the whole, it would appear that the project intervention could only have some marginal positive impact on the level of food consumption and hence on the nutritional status of the population in the area.

Table 7.7

Changes in the Level of Consumption of Food Items Compared to the Pre-Project Situation

(percentage of households)

Food Items	Project				Control			
	Increase	No change	Decrease	Not reported	Increase	No change	Decrease	Not reported
1. Homestead								
Fruits	18.1	49.4	26.5	6.0	-	16.0	60.0	24.0
Vegetables	41.0	41.0	12.0	6.0	32.0	32.0	16.0	20.0
2. Purchased								
Rice	25.3	69.9	4.8	-	4.0	88.0	8.0	-
Atta	16.9	63.9	13.3	6.0	4.0	64.0	8.0	24.0
Fish	14.5	14.5	71.1	-	4.0	-	96.0	-
Vegetables	12.0	48.2	36.6	1.2	8.0	44.0	48.0	-
Fruits	10.8	49.4	38.6	1.2	4.0	52.0	44.0	-
Snacks	16.9	59.0	4.8	19.3	-	56.0	12.0	32.0
Other foods	3.6	65.1	12.0	19.3	-	52.0	12.0	36.0

Source: BIDS/SSISP Household Survey 1992.

7.3.1 Food Shortage

In the absence of a comprehensive nutrition survey, the adequacy of food intake could not be properly established in this study. Moreover, food shortage has a number of intra-household dimensions involving age, gender and a number of other aspects. However, the incidence of food shortage experienced by the households on a monthly basis are reported in Table 7.8. It may be emphasized here that this does not provide any quantitative magnitude of the extent of food shortage; rather it points to the incidence of shortages for households in different months of the year. The information is presented only for those households owning land less than one acre (40 hectare), since this is the group which is most likely to face food shortages in rural Bangladesh.

Table 7.8 shows that the peak shortages is experienced in the month of Chaitra in both project and control area. In fact, all the households faced food shortages in the control area during this month. The other months of high shortages (where the percentages of households reporting shortages exceed 30 per cent) are Kartik in the project area, and Falgun and Baishakh in the control area. The usual adjustment mechanism during such lean periods are, either to borrow (mostly from surplus households) or restrict consumption on both. This has been reported in both the project and the control area.

Table 7.8

Incidence of Food Shortage for Households Owning Less than One Acre (.40 ha) of Land

Month	Per cent of households faced shortages			
	Project		Control	
	Yes	No	Yes	No
Baishakh	10.5	89.5	50.0	50.0
Jaistha	-	100.0	-	100.0
Ashar	5.3	94.7	-	100.0
Sravan	8.8	91.2	-	100.0
Bhadra	12.3	87.7	25.0	75.0
Aswin	26.3	73.7	12.5	87.5
Kartik	49.1	50.9	12.5	87.5
Agrahayan	7.0	93.0	12.5	87.5
Poush	5.3	94.7	25.0	75.0
Magh	1.8	98.2	25.0	75.0
Falgun	22.8	77.2	62.5	37.5
Chaitra	50.9	49.1	100.0	-

Source: BIDS/SSISP Household Survey 1992.

CHAPTER 8

OTHER SOCIO-ECONOMIC IMPACTS

The project document did not incorporate any explicit objectives for improving social and physical infrastructures and services in the area except aiming to form farmers' cooperatives through BRDB in order to ensure efficient utilization of irrigation equipment. BADC and DAE were also supposed to supply input and provide extension services to the farmers in the project area. No explicit socio-economic objectives or any distributional targets for the project area, were envisaged.

8.1 Demographic Characteristics

Table 8.1 shows the basic demographic characteristics of the farm family in the project and the control area. It is observed that the average size of household is somewhat higher in the project area than in the control area. So is the size ratio (number of male per hundred female). The structural characteristics of the families in terms of farm size categories are shown in Table 8.2.

Table 8.1

Basic Demographic Characteristics of the Survey Villages

Type of Village	No. of Villages	No. of HHs	Population		Sex Ratio (Male/Female)	Average Size of Household
			Male	Female		
Project	17	3778	11,178	9,192	122	5.39
Control	1	135	135	320	113	5.04

Source: BIDS/SSISP Village Level Survey, 1992.

Table 8.2 shows that the average family size is 6.1 in the project area as compared to 5.3 in the control area. The family members in the minor age group of 0-14 years, constitute less than half (about 42 per cent) of all members in both the project and control areas.

Table 8.2

Structural Characteristics of Households by Farm Size Categories

Farm Size (ha)	Project							Control						
	Family Size (No.)	% of members belonging to age group (years)						Family Size (no)	% of members belonging to age-group (years)					
		0-4	5-14	15-29	30-44	45-65	65+		0-4	5-14	15-29	30-44	45-65	65+
0.00 - 0.20	5.5	10.4	33.5	26.4	14.9	14.1	0.7	5.8	3.4	51.7	13.8	20.7	10.3	-
0.21 - 1.01	6.5	10.4	26.4	31.3	14.6	13.2	4.2	4.9	9.5	32.4	25.7	20.3	9.3	2.7
1.02 - 2.02	8.0	12.5	37.5	25.0	20.0	5.0	-	4.0	-	41.7	8.3	33.3	8.3	8.3
2.03 & above	7.6	13.2	22.6	26.4	17.0	15.1	5.7	9.0	22.2	5.6	33.3	22.2	11.1	5.6
All farm	6.1	10.9	30.6	27.7	15.4	13.2	2.2	5.3	9.0	33.6	22.6	21.6	9.8	3.0

Source: BIDS/SSISP Household Survey, 1992.

Table 8.3 presents information on the type of families and outside members residing in the households. The nucleus family (husband, wife and children) dominates among the household in both the areas. It is also observed that only large size farm-households keep permanent servants to assist in the household as well as farming activities.

8.2 Occupational Pattern

Table 8.4 shows that occupational patterns of heads of the households as well as of all members of the labour force (aged 15 years and above) in both the project and the control area. About one-third of the households in the project area are dependant on self-employment in agriculture, while another 9 per cent on wage employment. In the project area, the dependency on non-agricultural occupations is greater - about 35 per cent on self-employment and about 15 per cent on wage employment. The incidence of secondary occupations is rather moderate - about 43 per cent. The pattern is similar in case of all earning members. In the control area, on the other hand, about two-thirds of the heads

Table 8.3

Type of Families and Outside Members of Household

Farm size (ha)	Project									Control								
	Type of family (% of households)					% of families having				Type of family (% of household)					% of families having			
						Permanent Servant		Non-relative							Permanent Servant		Non-relative	
	1	2	3	4	5	Average No.	%	Average No.	%	1	2	3	4	5	Average No.	%	Average No.	%
0.00 - 0.20	63.3	6.1	14.3	-	16.3	-	-	-	-	80.0	-	-	-	20.0	-	-	-	-
0.21 - 1.01	45.5	-	13.6	-	40.9	4.5	1.0	-	-	80.0	6.7	13.3	-	-	13.3	1.0	-	-
1.02 - 2.02	60.0	-	-	-	40.0	40.0	1.0	-	-	33.3	33.3	-	-	33.3	33.3	1.0	-	-
2.03 & above	14.3	-	14.3	-	71.4	28.6	2.5	-	-	-	-	-	-	100.0	100.0	3.0	-	-
All farms	**54.2**	**3.6**	**13.3**	-	**28.9**	**6.0**	**1.6**	-	-	**68.0**	**8.0**	**8.0**	-	**16.0**	**20.0**	**1.8**	-	-

Source: BIDS/SSISP Household Survey, 1992.

Note: Type 1 : Husband, wife and children
Type 2 : Husband/wife with or without children
Type 3 : Types 1/2 and other relatives but not couples
Type 4 : At least two couples belonging to the same generation, with or without children and other relatives
Type 5 : Type 4 with couples belonging to two generations

Table 8.4

Occupational Patterns of Heads and Other Members of Households by Farm Size Categories: Main Occupation

Farm size (ha)	Project									Control								
	Head of Households					All members				Head of Households					All members			
	Agril.		Non-agr.		With secon-dary occup.	Agril.		Non-agr.		With secon-dary occup.	Agril.		Non-agr.		With secon-dary occup.	Agril.		Non-agr.		With secon-dary occup.
	Self	Wage	Self	Wage		Self	Wage	Self	Wage		Self	Wage	Self	Wage		Self	Wage	Self	Wage	
0.00 - 0.20	6.3	14.6	60.4	18.8	37.5	6.9	18.1	56.9	18.1	34.7	-	60.0	40.0	-	20.0	-	55.6	44.4	-	22.2
0.21 - 1.01	66.7	-	9.5	23.8	52.4	65.1	7.0	14.0	14.0	46.5	92.3	-	7.7	-	53.8	81.8	4.5	13.6	-	68.2
1.02 - 2.02	100.0	-	-	-	60.0	100.0	-	-	-	50.0	66.7	-	-	33.3	-	75.0	-	-	25.0	25.0
2.03 & above	100.0	-	-	-	3.3	92.3	-	-	7.7	30.8	-	-	-	100.0	100.0	25.0	-	-	75.0	50.0
All farms	**35.0**	**8.8**	**38.8**	**17.5**	**42.5**	**39.0**	**11.8**	**34.6**	**14.7**	**39.0**	**63.6**	**13.6**	**13.6**	**9.1**	**40.9**	**56.4**	**15.4**	**17.9**	**10.3**	**51.3**

Source: BIDS/SSISP Household Survey 1992.

of the households are engaged in self-employment in agriculture, while another 14 per cent in wage employment. The dependency on non-agricultural occupation is much lower - about 23 per cent. The incidence of secondary occupations for all members is greater as compared to the project area.

The sub-sectoral pattern of occupations of heads of the households are provided in Table 8.5. It is observed that in case of primary occupations, about 75 per cent of the heads of the households are engaged in self-employment, as compared to 80 per cent in the control area. Such predominance of self-employment is also observed among the heads of the households in case of secondary occupation in both the areas.

Table 8.5

Sub-sectoral Distribution of Occupations of Heads of Households in the Project and Control Areas

(per cent of households)

Occupational Category	Project		Control	
	Primary	Secondary	Primary	Secondary
Crop agriculture				
Self	33.7	16.9	56.0	16.0
Wage	8.4	7.2	12.0	4.0
Non-crop agriculture				
Self	-	1.2	-	4.0
Wage	-	-	-	-
Manufacturing				
Self	4.8	-	8.0	-
Wage	-	-	-	-
Trade				
Self	18.1	7.2	-	8.0
Wage	-	-	-	-
Transport				
Self	3.6	-	-	-
Wage	6.0	-	-	-
Construction				
Self	7.2	1.2	4.0	-
Wage	-	-	-	-
Service				
Self	3.6	1.2	-	-
Wage	10.8	6.0	8.0	4.0
Others				
Self	3.6	3.6	12.0	4.0
Wage	-	-	-	-

Source: BIDS/SSISP Household Survey 1992.

Table 8.6 shows the changes in the occupational pattern of the working members of households in both the project and the control area. It is observed that about one-third of the male and about one-fifth of the female reported

Table 8.6

Changes in Occupational Pattern of Working Members in the Project and the Control Area

Farm Size (ha)	Project		Control	
	% of working members who changed occupation		% of working members who changed occupation	
	Male	Female	Male	Female
0.00 - 0.20	30.4	25.8	0	40.0
0.21 - 1.01	39.0	18.5	17.6	18.8
1.02 - 2.02	37.5	0	66.7	33.3
2.03 & above	26.7	21.4	60.0	16.7
All farms	33.3	22.0	25.8	23.3

Source: BIDS/SSISP Household Survey 1992.

changes in the occupation following the completion of the project. However, whether such changes could be attributed directly to project intervention remains unclear. In the control area, such changes in occupation are observed to be somewhat smaller for males and almost the same for females.

8.3 Income Distribution

Table 8.7 shows the distribution of income by farm size categories in both the project and the control area. In the project area, average household income and per capita income are reported to be Tk. 40480 and Tk. 6643 respectively, as compared to Tk. 33865 and Tk. 6367 in the control area. Thus the households in the project area report about 16 per cent higher income per household and 4 per cent higher income per person than those in the control area. However, this difference should be attributed to the large differences that exist in the top

Table 8.7

Income Distribution and Average Yearly Income by Various Income Groups

Household Income ('000 Tk.)	Project				Control			
	% of household	% of income	Average Yearly Income (Tk.)		% of household	% of income	Average Yearly Income (Tk.)	
			Per household	Per person			Per household	Per person
0 - 8	3.61	0.45	5000.0	1666.7	-	-	-	-
8 - 12	2.41	0.64	10707.5	1946.8	-	-	-	-
12 - 15	10.84	3.62	13553.2	3296.7	8.00	3.32	14075.0	9383.3
15 - 20	6.02	2.63	17710.4	4025.1	28.00	14.21	17186.7	3646.7
20 - 30	21.69	12.86	24048.3	4556.5	32.00	22.98	24321.1	4746.6
30 - 40	16.87	14.20	34142.0	4877.4	12.00	12.44	35098.3	5541.8
40 - 50	18.07	20.03	44961.6	6438.4	-	-	-	-
50 - 60	7.23	10.59	57762.2	9366.8	8.00	12.87	54474.0	8380.6
60 & above	13.25	35.08	107364.2	12837.0	12.00	34.17	96453.3	12056.7
All groups	**100.00**	**100.00**	**40479.6**	**6643.2**	**100.00**	**100.00**	**33865.2**	**6366.6**

Source: BIDS/SSISP Household Survey, 1992.

income categories. In the low and middle income categories, there is hardly any difference in average household income between the two areas. Top 20 per cent of the households receive about half of the total income in both the project and the control area. However, the overall income distribution is observed to be more skewed in the project area as reflected in the Gini concentration ratio of .84 and .69 estimated for the project and control area respectively.

The sources of income as presented in Table 8.8 indicate that there is not much difference in this respect among the households in the project and the control area. Agriculture provides about half of the total income in both the areas, in which crop production dominates contributing nearly 40 per cent of income earned.

Table 8.8

Source of Income in the Project and Control Area

Sector/Sub-sector	Percentage of Yearly Household Income Accrued	
	Project	Control
Agriculture	51.15	49.21
Crop	42.31	40.12
Non-crop	8.84	9.09
Non-agriculture	39.76	30.07
Trade	17.83	7.09
Industry	-	0.07
Transport	2.76	2.13
Wages	19.17	20.78
Others	9.09	20.72
Total	**100.00**	**100.00**

Source: BIDS/SSISP Household Survey 1992.

Table 8.9 provides a more disaggregated picture of the sources of income by farm sizes category in the project and the control area. It is readily observed that the average household income of all farm size categories and the average per capita income of all but one category (0.21 - 1.01 category) are greater in the project area than in the control area. This shows that average income per household is greater in the project area not only in the aggregate (all farm households taken together) but for each farm size category as well. This is largely due to higher crop income derived by most of the farm households in the project area.

Table 8.9

Average Income Per Household from Different Sectors by Farm Size Categories

Farm size (ha)	Average Income (Per Household) from Different Sectors by Farm Size Categories							Total Income Per Household	Per Capita Income
	Agril. Sector		Non-Agricultural Sector			Non-Agril. Wage Income	Non-Agril. Other Income		
	Crop	Non-Crop	Trade	Industry	Transport				
A. PROJECT AREA									
0.00 - 0.20	4915.45	1718.78	9702.00	0.00	1231.00	7059.29	986.22	25612.74	4669.77
0.21 - 1.01	21596.41	3636.27	4079.00	0.00	1091.00	9989.68	3799.23	44191.59	6751.49
1.02 - 2.02	38723.00	3930.00	0.00	0.00	1690.00	8465.60	5390.00	58198.60	7274.75
2.03 & above	73176.14	16140.00	4857.00	0.00	0.00	5142.86	20912.29	120228.29	15879.23
All farms	**17130.43**	**3576.48**	**7218.00**	**0.00**	**1117.00**	**7759.11**	**3677.64**	**40479.60**	**6643.22**
B. CONTROL AREA									
0.00 - 0.20	10571.60	2160.00	0.00	46.00	0.00	9864.80	0.00	22642.40	3903.86
0.21 - 1.01	16190.27	2616.67	4000.00	27.00	1200.00	2543.40	7072.20	33649.20	6820.78
1.02 - 2.02	4204.33	4950.00	0.00	0.00	0.00	0.00	12575.67	21733.00	5433.25
2.03 & above	15659.00	6050.00	0.00	0.00	0.00	44235.00	15796.00	81740.00	9082.22
All farms	**13585.72**	**3080.00**	**2400.00**	**25.00**	**720.00**	**7037.80**	**7016.44**	**33865.16**	**6365.63**

Source: BIDS/SSISP Household Survey 1992.

8.4 Asset Ownership

Table 8.10 makes a comparison of the asset ownership by type in the project and the control area. It is observed that all households own agricultural productive assets in both the areas. In case of non-agricultural assets, however, a larger percentage of households is observed to own them in the project area than in the control area. There is not much to distinguish in case of ownership of non-productive assets between the two areas. However, the difference is more pronounced in case of average value of assets owned. Average value of agricultural productive asset has been higher among the farm households in the project area, though the difference has narrowed down following the implementation of the project. In case of non-agricultural asset, however, the average value has been higher in the control area, though again the difference is much smaller compared to the pre-project situation. The difference is most

Table 8.10

Ownership of Productive Assets in the Project and Control Area

Type of assets	Percentage of households who possess them at present		Average value of asset at present (Tk)		Percentage difference of project over control	Average value of asset at pre-project situation (Tk)		Percentage difference of project over control
	Project	Control	Project	Control		Project	Control	
Agricultural productive assets	100.0	100.0	16864	15579	8.3	15797	12237	29.1
Non-agricultural	25.3	16.0	1419	1419	-4.3	1143	1504	-24.0
Other (non-productive) fixed assets	98.8	96.0	19875	47468	-58.1	15174	42366	-64.2

Source: BIDS/SSISP Household Survey, 1992.

pronounced in case of non-productive assets. The average value of such assets is observed to be more than twice among the households in the control area than in the project area. This difference persists even in the post-project period.

Draught animals represent an important agricultural assets among the farm households in rural areas in Bangladesh. Table 8.11 presents information regarding ownership of draught animal in the project and the control area. The average number of draught animal owned seem to have declined in both the areas. The decline is more pronounced in the control area. The percentage of households owning draught animals. however showed perceptible improvement in the control area.

Table 8.11

Ownership of Draught Animal in the Project and Control Area

	Percentage of households who loan drought animal		Average number owned per household	
	Now	Pre-project	Now	Pre-project
Project	26.5	27.7	2.2	2.5
Control	40.0	28.0	2.1	3.4

Source: BIDS/SSISP Household Survey 1992.

8.5 Pattern of Expenditure

Average yearly household expenditures by broad categories are presented in Table 8.12. It is observed that the average household expenditure in the project area is only slightly higher than in the control area. This represents the overall picture. For each farm category, however, average expenditure is substantially greater in the project area than the corresponding group in the control area. This is particularly pronounced for the farm households in the second largest category where the reported average household expenditure is more than double in the project area. This may be attributed to the relatively much lower income earned by the households in this category in the control area, as we observed earlier. The distribution of expenditure on broad categories displays more or less similar pattern with food item claiming lion's share (about 64 per cent of total expenditures) in both the areas. As expected, the percentage spent on food item generally exhibit a declining tendency with the increase in farm size. Expenditure on productive investments are quite low in both project and control areas. Investment expenditures are slightly higher in the project area than in the control area. Therefore, the expenditure pattern among the households in the project and the control area reflect no substantial difference that could be attributed to project intervention.

Table 8.12

Average Yearly Household Expenditures by Broad Categories

Farm Size (ha)	Project						Control					
	Total expenditures (Tk.)	Percentage of expenditures on					Total expenditures (Tk.)	Percentage of expenditures on				
		Food	Clothing & household items	Human development	Other items	Investment expenditure		Food	Clothing & household items	Human development	Other items	Investment expenditure
0.00 - 0.20	20696.9	75.4	18.2	3.4	2.8	0.3	19288.6	77.6	16.5	4.4	1.6	0.01
0.21 - 1.01	45332.0	59.4	11.1	5.9	15.4	6.1	36684.3	60.2	12.5	4.6	20.9	1.8
1.02 - 2.02	77799.8	61.0	8.1	5.7	23.5	1.8	31745.7	77.0	10.8	5.4	6.6	0.2
2.03 & above	86838.0	55.8	12.7	12.6	19.5	1.5	78051.5	56.8	16.1	11.9	12.5	1.1
All farms	36244.9	63.9	13.4	6.4	13.7	2.7	35921.9	63.6	15.4	5.9	15.8	1.3

Source: BIDS/SSISP Household Survey 1992.

Table 8.13 provides a picture in both the areas the perception of the households regarding their status in terms of surplus/deficit position throughout the year. It is observed that 28 per cent of the households in the control area consider themselves as surplus compared to 13 per cent in the project area. Also, only 12 per cent of the households in the control area face (year-round and frequent) deficits, as compared to about 20 per cent in the project area. Thus, the households in the control area appear to be favourably placed both with respect to surplus as well as (year-round and frequent) deficit position throughout the year. However, the percentage of households who consider themselves (more or less) balanced are considerably greater in the project area (44%) than in the control area (32%). As expected, the well balanced and surplus households are mostly concentrated in the higher farm size groups. Finally, the incidence of extreme poverty would seem to be quite low in both the areas. However, this has can hardly be attributed to project intervention.

Table 8.13

Self-Assesment of Household On Surplus/Deficit Status

Farm size (ha)	Project						Control					
	Percentage of households over the year						Percentage of households over the year					
	Year round deficit	Frequent deficit	More or less balanced	Balanced	Well balanced	Surplus	Year round deficit	Frequent deficit	More or less balanced	Balanced	Well balanced	Surplus
0.00 - 0.20	10.2	16.3	40.8	10.2	18.4	4.1	20.0	20.0	40.0	-	-	20.0
0.21 - 1.01	4.5	9.1	27.3	9.1	36.4	13.6	-	6.7	33.3	-	33.3	26.7
1.02 - 2.02	-	-	40.0	-	40.0	20.0	-	-	-	33.3	66.7	-
2.03 & above	-	14.3	-	14.3	-	71.4	-	-	-	-	-	100.0
All farms	7.2	13.3	33.7	9.6	22.9	13.3	4.0	8.0	28.0	24.0	28.0	28.0

Source: BIDS/SSISF Household Survey 1992.

8.6 Impact on Non-Agricultural Activities

Growth in agriculture is generally expected to induce growth in non-agricultural activities in an area through both backward and forward linkage effects. Due to indirect nature of such impact and the simultaneous operation of many other factors, it is difficult to attribute all such changes to project intervention. Given the scope of this study, no detailed information was collected on employment. output, capital requirements, and other aspects of such activities. Hence, only some indicative assessment of project impact on non-agricultural activities can be made. In fact, some idea regarding the importance of non-agricultural activities for different size categories of households have already been provided in the earlier sections of this chapter. Table 8.14 presents some information on the impact on non-agricultural occupations in the project areas, as perceived by the local people.

Table 8.14

Impact on Non-agricultural Occupations in the Project Area

Occupational Groups	Percentage of villages reporting		
	Beneficial impact	No impact	Adverse impact
Rice-mill owner	100.0	-	-
Blacksmith	29.4	70.6	-
Potter	5.9	88.2	5.9
Weaver	5.9	94.1	-
Fisherman	-	41.2	58.8
Boatman	5.9	58.8	35.3
Rickshaw/Bullock cart owner	100.0	-	-
Milkmen	5.9	88.2	5.9
Service holders	58.8	41.2	-
Physician/Ayurbedic practitioners	35.3	64.7	-
Mechanics/Repairers	52.9	47.1	-

Source: BIDS/SSISP Village Level Survey 1992.

It is observed that all of the rice mill owners and rickshaw/bullock cart owners have reported beneficial impact of the project. The rice mill owners have benefitted from the greater output of rice crop in the project area. Since embankment as part of project structure contributed to improvement in road transport, this has benefitted the rickshaw/bullock cart owners. The mechanics and repairers also have experienced increased demand for their services due to installation and operation of irrigation equipment in a greater number. On the other hand, quite a large number of villages have reported adverse impact of the project on fishery and water navigation. Water navigation has been adversely affected by the construction of embankment. Also, the project has had considerable negative impact on open water fishery, which, as we observed earlier, has not been offset through development of pond fishery in the area. For most other occupational groups, the project did not have any noticeable impact on their activities.

8.7 Marketed Surplus

Marketed surplus which serves as an indicator of the extent of commercialization in a region constitutes a secondary and indirect impact of project intervention in the area. A larger surplus implies greater activities in the trading sector. However, since the extent of trading activities cannot be directly and fully captured in this study, only an indirect evidence of an enlarged scope of secondary and tertiary activities will be reflected in our information on gross marketed surplus of the sampled farm households in survey areas. Table 8.15 presents data on the sale of agricultural products in the project and the control area during the year preceding the survey.

It is observed that the amount of sale per household is about 10 per cent higher in the project area than in the control area. Average sale is higher for the all the groups except that of (0.21 - 1.01) ha. Value of sales as a percentage of total value of crop production, however, is greater among the farm households in the control area.

Table 8.15

Sale of Agricultural Products by Farm Size Categories in the Project and the Control Area

Farm Size (ha)	Average Sale per Household (Tk.)	Per cent of total sale	Sale as per cent of total crop income
Project Area			
0.00 - 0.20	1399	1.0	6.7
0.21 - 1.01	6333	19.9	21.7
1.02 - 2.02	36,862	26.3	61.0
2.03 & above	52,180	52.8	48.2
All farms	17,957	100.0	38.6
Control Area			
0.00 - 0.20	-	-	-
0.21 - 1.01	13,854	64.3	44.5
1.02 - 2.02	14,277	13.2	74.4
2.03 & above	36,410	22.5	49.5
All farms	16,173	100.0	48.2

Note: The average sales for these households who actually sale during the period.

Source: BIDS/SSISP Household Survey, 1992.

CHAPTER 9

IMPACT ON THE SITUATION OF WOMEN

This analysis is primarily concerned with whether a share of the gains from Barnai project intervention reaches the female members of the households. Since the project had been, to a significant extent, successful in increasing agricultural productivity and household income in the project area, it will be useful to examine whether such changes have any impact on the situation of women. The impact is assessed by comparing the situation of women in the project and control areas in terms of access to food, clothing and a few other aspects of personal wellbeing. At the same time, a comparison of the situations of adult men and women in both project and control area will reveal whether male-female differences decrease with an increase in family income.

9.1 Women's Perception of the Benefits of the Project

An enquiry was made about the awareness of women about the project. It is not at all surprising that women who live within the household premises will not know about the outside world. Table 9.1 shows that only 29 per cent of the women have correct knowledge about the project and its objectives. Another 36 per cent have only partial knowledge about the project. 35 per cent women were unaware about the project.

To assess the benefits of the project on women's lives, information was collected on the perceived benefits resulting from the impact of the project on the economic activities in the project villages. 42 per cent of the women members reported an increase in crop activities and 58 per cent reported an increase in household activities due to the impact of the project (Table 9.2). A large proportion of women reported a positive impact on the quality of food for herself and for the family, about 60 per cent reporting such benefits (Table 9.3).

Table: 9.1

Awareness of Women About the Project

Farm Size (ha)	Whether aware of the project (% of cases in each group)			
	Fully	Partly	No	Total
0.00 - 0.20	24.5	36.7	38.8	100.0
0.21 - 1.01	31.8	27.3	40.9	100.0
1.02 - 2.02	60.0	20.0	20.0	100.0
2.03 & above	28.6	71.4	-	100.0
All Farms	28.9	36.1	34.9	100.0

Source: BIDS/SSISP Household Survey 1992.

Table 9.2

Changes in Women's Activities in the Project Villages

Aspects of Change	% of cases with			
	Increase	Same	Decrease	Not Applicable
Family income	61.4	20.5	18.1	-
Work on crop activity	42.2	4.8	8.4	44.6
Cooking, cleaning activity	57.8	22.9	3.6	15.7

Source: BIDS/SSISP Household Survey 1992.

Table 9.3

Nature of Benefit Derived by Women from the Project

Items	Per cent of respondents reporting changes			
	Yes	No	Don't Know	Not Applicable
Better food for self	60.2	-	-	39.8
More clothing for self	59.0	1.2	-	39.8
More pocket money	48.2	12.0	-	39.8
Better food for husband, children	59.0	1.2	-	39.8
Schooling for children	39.8	15.7	-	44.6
More hired labour reducing burden of work	10.8	34.9	-	54.2
Others	-	2.4	-	97.6

Source: BIDS/SSISP Household Survey 1992.

9.2 Impact on Women's Employment and Earnings

Table 9.4 shows employment among women in different types of directly productive activities. The earnings reported here do not represent earnings from the total labour input supplied by women or from the activity where labour is applied. Earnings are included only if payments are made directly to women. Thus, for family activity, earning may not be related to the share of labour input. This was done to derive information on actual access to earnings. The table indicates that women's workload is much higher in the project area compared to the control area. Average amount of labour input on crop processing in the project area is more than three times the hours on the same activity in the control area. This is due to the higher productivity of HYV paddy

Table 9.4

Income Earning Activities of Women in Project and Control Area

Type of activity	Project Area			Control Area		
	No. of women engaged	Average hours last month	Average income last year	No. of women engaged	Average hours last month	Average income last year
Poultry	57	19.4	371.1	20	17.2	442.5
Livestock (goats+cows)	53	50.6	1118.8	14	40.3	696.7
Kitchen garden	35	24.2	478.8	11	30.2	298.2
Cultivation	6	77.5	200.0	-	-	-
Crop processing	28	89.0	553.3	9	61.1	166.7
Trade	4	127.5	160.0	-	-	-
Handicraft	8	48.5	200.0	2	60.0	265.0
Domestic service	6	48.7	275.0	2	150.0	360.0
Field employment	-	-	-	1	30.0	100.0
Other work	9	40.2	1188.9	1	90.0	500.0
Total	76	120.3	1602.1	23	101.3	1038.2

Note : The totals do not add to total sample of women workers since many women are involved in multiple activities.

Source: BIDS/SSISP Household Survey 1992.

crops in these villages and the larger percentage of area devoted to such crops. In the project area, more time is spent on other agricultural activities, like poultry and livestock raising and kitchen gardening (Table 9.4). Earnings by women are also larger in the project area compared to the control area.

9.3 Access to Food, Clothing and Leisure

The situation of women in the project and control villages will be compared in terms of their access to basic needs. In the analysis, access to food and clothing and leisure are considered. Data on leisure time are presented for women and men in Tables 9.5 and 9.6 respectively. Table 9.5 shows that women in the control area has slightly smaller opportunity of having rest compared to the project area. About 42 and 64 percent women in project and control areas respectively enjoyed less than one hour of rest (rest being defined as time other than directly productive work, housework, essential personal activities, sleep at night) during the last 24 hours. In terms of landownership, it is observed that a larger percentage of women from landowning groups go without leisure compared to landless women. This is because, landless/marginal farmers have less work to do for processing of crops. Table 9.6 shows that men are over-worked

Table 9.5

Access to Leisure by Women during Last 24 Hours

Farm size (ha)	Percentage of women with			
	No rest	Less than 1 hour	1-2 hours	More than 2 hours
PROJECT AREA				
0.00 - 0.20	12.2	28.6	30.6	28.6
0.21 - 1.01	13.6	27.3	36.4	22.7
1.02 - 2.02	20.0	40.0	40.0	-
2.03 & above	28.6	14.3	28.6	28.6
All Farms	14.5	27.7	32.5	25.3
CONTROL AREA				
0.00 - 0.20	60.0	-	20.0	20.0
0.21 - 1.01	20.0	46.7	26.7	6.7
1.02 - 2.02	33.3	-	66.7	-
2.03 & above	-	100.0	-	-
All Farms	28.0	36.0	28.0	8.0

Source: BIDS/SSISP Household Survey 1992.

Table 9.6

Access to Leisure by Men during Last 24 Hours

Farm size (ha)	Percentage of Men with			
	No rest	Less than 1 hour	1-2 hours	More than 2 hours
PROJECT AREA				
0.00 - 0.20	46.7	22.2	22.2	8.9
0.21 - 1.01	36.4	22.7	4.5	36.4
1.02 - 2.02	40.0	40.0	20.0	-
2.03 & above	16.7	50.0	16.7	16.7
All Farms	41.0	35.6	15.7	16.7
CONTROL AREA				
0.00 - 0.20	60.0	20.0	-	20.0
0.21 - 1.01	23.1	30.8	38.5	7.7
1.02 - 2.02	50.0	-	-	50.0
2.03 & above	-	-	-	100.0
All Farms	33.3	23.8	23.8	19.0

Source: BIDS/SSISP Household Survey 1992.

in both the project and control areas. In the project area, nearly 67 per cent of male workers enjoyed less than one hour of rest compared to 57 per cent in the control area.

Table 9.7 shows access to food by men and women in the family in both the project and control areas. Number of meals is taken as a broad indicator because it was not possible within the timeframe of this study and the survey work, to collect detailed data on itemwise consumption by individuals. The average number of meals taken by men and women is very close. In fact, the average number of meals taken by women is slightly smaller in the project area compared to the control area. If two half meals are considered to constitute one

Table 9.7

Average Number of Meals Per Day Per Person in the Project and Control Area

Farm size (ha)	Project Area				Control Area			
	Average Number of				Average Number of			
	Full meals		Half meals		Full meals		Half meals	
	Wife	Husband	Wife	Husband	Wife	Husband	Wife	Husband
0.00 - 0.20	2.4	2.8	1.0	0.9	2.4	2.8	1.0	1.0
0.21 - 1.01	2.6	2.8	1.2	1.0	2.7	2.8	0.8	0.9
1.02 - 2.02	2.9	3.0	0.7	-	2.7	2.7	1.0	0.7
2.03 & above	2.9	3.0	1.0	-	3.0	3.0	-	-
All Farms	2.5	2.8	1.0	0.9	2.7	2.8	0.9	0.9

Source: BIDS/SSISP Household Survey 1992.

full meal, then the average number of meals per day is 3 or higher, even for landless households. This high figure may be due to the fact that the period of survey was one of peak availability of food. Situation of women in this respect in the project area is not better than that in the control area.

The fact that higher average income in the project area is not reflected in improved consumption, is also reflected in the case of clothing. Women in the control area possess 3.2 sarees compared to 2.8 per women in the project area (Table 9.8). In the project area, both men and women from the two largest land-owning group enjoy a larger number of dresses compared to the control area. Women from the small land owning families in the project area are better off compared to the control village. In general, women possess more sarees compared to the number of shirts for men reflecting the prevailing socio- cultural norms.

Table 9.8

Number of Dresses Used by Men and Women

Farm size (ha)	Project Area		Control Area	
	Average no. of dresses		Average no. of dresses	
	Female dress (sarees)	Male dress (shirts)	Female dress (sarees)	Male dress (shirts)
0.00 - 0.20	2.5	1.5	2.2	1.0
0.21 - 1.01	3.0	2.1	3.3	1.7
1.02 - 2.02	3.4	2.8	3.7	2.0
2.03 & above	4.0	2.7	4.0	3.5
All Farms	2.8	1.8	3.2	1.8

Source: BIDS/SSISP Household Survey 1992.

9.4 Women's Decision Making Role

Another set of indicators of welfare that have been used relate to women's decision making role reflected in (i) the role of men and women in Eid shopping: (ii) consideration of women's opinion in purchasing their sarees and (iii) freedom of women in visiting other families in the village. The information on the first two issues do not reveal any clear pattern (Table 9.9 and 9.10). While the extreme case of decision taken only or mainly by men is larger in the control area, the mixed role in decision making varies. Women play the major role in Eid shopping in 12 per cent cases, in both the project and control area. In the project area, in a larger percentage of cases women's opinion are considered in the purchase of their sarees. The freedom of movement without objection from male guardian is larger in the control area compared to the project area (Table 9.11).

Table 9.9

Role of Men and Women in Taking Decisions About Eid Shopping

(in per cent)

Farm size (ha)	Only husband/ male gurdian	Mainly husband/ male gurdian	All house-hold members	Mainly respon-dent herself	Mainly other female members of house-hold	Only respon-dent female member
PROJECT AREA						
0.00 - 0.20	36.7	20.4	26.5	14.3	2.0	-
0.21 - 1.01	22.7	27.3	45.5	4.5	-	-
1.02 - 2.02	20.0	-	80.0	-	-	-
2.03 & above	-	28.6	57.1	14.3	-	-
All Farms	28.9	21.7	37.3	10.8	1.2	-
CONTROL AREA						
0.00 - 0.20	80.0	20.0	-	-	-	-
0.21 - 1.01	26.7	13.3	46.7	13.3	-	-
1.02 - 2.02	33.3	33.3	-	33.3	-	-
2.03 & above	-	50.1	50.0	-	-	-
All Farms	36.0	20.0	32.0	12.0	-	-

Source: BIDS/SSISP Household Survey 1992.

Table 9.10

Consideration of Women's Opinion in the Purchase of their Sarees

(in per cent)

Farm Size (ha)	Percentage of households where women's opinion is considered				
	Never	Sometimes	Always	Purchased by self	Others
PROJECT AREA					
0.00 - 0.20	65.9	18.2	15.9	-	-
0.21 - 1.01	45.5	31.8	18.2	4.5	-
1.02 - 2.02	20.0	40.0	40.0	-	-
2.03 & above	16.7	66.7	16.7	-	-
All Farms	53.2	27.3	18.2	1.3	-
CONTROL AREA					
0.00 - 0.20	80.0	14.3	-	-	-
0.21 - 1.01	60.0	26.7	13.3	-	-
1.02 - 2.02	50.0	50.0	-	-	-
2.03 & above	-	50.0	50.0	-	-
All Farms	58.3	29.2	12.5		

Source: BIDS/SSISP Household Survey 1992.

Table 9.11

Freedom of Women in Visiting Other Families in the Village

(in per cent)

Farm Size (ha)	Project Area			Control Area		
	Whether male gardians raise objection			Whether male gardians raise objection		
	Always	Some-times	Hardly	Always	Some-times	Hardly
0.00 - 0.20	11.4	43.2	45.2	-	20.0	80.0
0.21 - 2.01	31.8	18.2	50.0	14.3	-	85.7
1.02 - 2.02	-	20.0	80.0	-	50.0	50.0
2.03 & above	16.7	-	83.3	-	50.0	50.0
All Farms	16.9	31.2	51.9	8.7	13.0	78.3

Source: BIDS/SSISP Household Survey 1992.

Thus the comparison of project and control area does not show any clear impact of project on the decision making role of women.

On the whole, it appears that the project impact on the village economy has created some changes in the lives of women in the project area. Changes had occurred in terms of higher workload in crop processing activities. The increased workload has been associated with a greater access to cash earnings by women. Women's access to food and clothing, however, does not show any large difference between the project and the control area. Women's lives also have not changed in terms of independence in decision making.

Table 9.11

Freedom of Women in Visiting Other Families in the Village

(in per cent)

Farm Size (ha)	Project Area			Control Area		
	Whether male gardians raise objection			Whether male gardians raise objection		
	Always	Some-times	Hardly	Always	Some-times	Hardly
0.00 - 0.20	11.4	43.2	45.2	-	20.0	80.0
0.21 - 2.01	31.8	18.2	50.0	14.3	-	85.7
1.02 - 2.02	-	20.0	80.0	-	50.0	50.0
2.03 & above	16.7	-	83.3	-	50.0	50.0
All Farms	16.9	31.2	51.9	8.7	13.0	78.3

Source: BIDS/SSISP Household Survey 1992.

Thus the comparison of project and control area does not show any clear impact of project on the decision making role of women.

On the whole, it appears that the project impact on the village economy has created some changes in the lives of women in the project area. Changes had occurred in terms of higher workload in crop processing activities. The increased workload has been associated with a greater access to cash earnings by women. Women's access to food and clothing, however, does not show any large difference between the project and the control area. Women's lives also have not changed in terms of independence in decision making.

CHAPTER 10

IMPACT ON ENVIRONMENT AND LIVELIHOOD SECURITY

10.1 Introduction

The main problem in the Baranai project area was monsoon flood which combined with inadequate drainage caused considerable damage to crops. The project, therefore, was designed to control flood and provide drainage facilities in order to protect crop from flood damage and water logging. We have observed that the project has largely succeeded in achieving its objective in controlling floods, and also in securing the area for extensive irrigation development, which contributed to enhanced foodgrain production in the area.

Although much emphasis was given to protection of crops from flood damage and water logging, and dissemination of high yielding varieties thereby boosting agricultural production, no environmental impact considerations were envisaged in the project proposal. In fact, there was no explicit concern on environmental situation during the project planning. However, it is now increasingly being realised that flood control, damage and irrigation projects bring about transformation in the physical characteristics of the project area and therefore, have important implications for livelihood security, ecology and environment. To investigate into these aspects, relevant information was collected in both village and household level survey so that an assessment of the environmental impact can be made.

10.2 A Description of the Physical Characteristics of the Project Area

10.2.1 Agro-ecological Sub-region

Baranai river sub-project lies in the young and older Meander Ganges Flood Plain or Lower Atrai Basin. This unit occupies a low-lying areas between Baranai Tract and Ganges River Flood Plain. The area is dominantly medium low land with some medium high land, which was suffering from monsoon flooding and inadequate drainage was causing damage to crops. Doughtiness of soil was

serious problems for the area where irrigation facilities were absent and rainfall was irregular to recharge the soil moisture. This in turn has been adversely affecting agricultural production in the area.

10.2.2 Soil Type and Land Use Pattern

The soil type in the project and control area is shown in Table 10.1 below.

Table 10.1

Area Under Different Soil Types

Soil Type	Percentage of area in	
	Project area	Control area
Clayey	55	25
Loamy	33	70
Sandy	12	5

Note: The classification is based on information collected from the villagers informed judgement of the agronomist. No technical soil survey could be conducted given the limited scope of the survey. The results, therefore, need to be interpreted accordingly.

Source: BIDS/SSISP Village Level Survey, 1992.

The suitability of soil for crop cultivation would appear to be better in the control area as the percentage of loamy soil (which is suitable for cultivation of all types of crops) is greater as compared to the project area. This greater potential for crop production has probably been offset by higher risk of flood damage in the control area.

10.2.3 River Flow

There are no active rivers in the project area. The main river Baranai flows from the Khari river. The flow of Baranai river has been affected by raising of the river bed through sedimentation. More recently, after the

introduction of engine boats. boat navigation in the narrow Baranai river has created bank erosion problem.

10.3 Physical Environmental Impact

10.3.1 Water Logging/Drainage Congestion

The project objective of flood control has been achieved with a beneficial impact on the level, timing, duration and extent of flooding, but at the expense of increased water logging in some project areas. In fact, water logging is a major problem in about one-third of the area located in the western part of the project. Construction of embankment, unplanned roads without bridges or culverts and lack of drainage canals may be cited as the major causes of water logging in the area. Excess irrigation water may roll down in the low-lying areas and cause water logging. Water logging causes nutrient deficiency in the soil. Submerged rice may also emit methane gas, which pollute the environment.

10.3.2 Wet Lands and Water Bodies

Reduction in the wet land and water bodies has been major impact in the area following the implementation of the project. Due to flood control, wet lands become dry during the dry season thereby reducing water bodies and wet lands. Increased pressure to meet the growing demand for foodgrain has prompted the people in the project area to reclaim these lands for cultivation. Reduction in water bodies have obviously exerted a negative impact on the fisheries, and also on surface water irrigation. Such negative impacts are most likely to aggravate further in the future.

10.3.3 Ground Water Levels

For Baranai sub-project, ground water table is an important issue since one of the major objectives of the project was to ensure sustained growth in crop production through provision of increased irrigation facilities. However, it has been observed that flood control in the areas has lowered water table due to inadequate recharge of ground water. According to the village level survey,

water level is declining very quickly on the higher ground and ridges, where shallow tubewells are extensively used for both irrigation and drinking water supply. In the 1992 rabi season, for example, it was reported that there was widespread use of shallow tubewells in the area. The villagers have to lower the pipe to reach deeper water level, both for irrigation and potable water supply. Long term monitoring of ground water table is necessary in the project area.

10.3.4 Ground Water Quality

The increased use of fertilizer and pesticides may cause chemical pollution of the ground water through infiltration and absorption but no concrete evidence on this has been reported. A monitoring system is needed to ascertain the gravity of the situation. High accumulation of iron in the ground water is a problem for crop cultivation as well as for human health. Also, this has not been proven yet. However, most of the villagers complained about the dysentery and ulceration problem which might be caused by the use of ground water. Extensive use of fertilizer in HYV rice cultivation may cause nitrate pollution in the near future. A controlled flooding of the area through some active regulators and surface water retention system may keep the ground water level recharged and also ensure the quality of ground water.

10.3.5 Surface Water Availability

With the implementation of the project, surface water availability has been reduced to a significant extent. Reduced river flow has caused siltation of the internal canals. Therefore, availability of surface water from khal, beel and canals for irrigation and domestic use has declined and is very low. Hardly any LLP irrigation has been observed in the project area.

10.3.6 Soil Fertility

Flood control has reduced the regular deposition of new silt on the cultivable land. The growth of blue-green algae on the flooded area has not taken place since the initiation of the project. Blue-green is a nitrogen fixing algae, and is mostly responsible for the natural fertilization of the land.

Therefore, natural fertilization of soil has been reduced to a significant extent. Moreover, use of chemical fertilizer for cultivation of HYV rice, use of farm-yard manure as fuel, mono-crop cultivation, and the absence of green manuring have been responsible for reduced soil fertility.

10.3.7 Soil Moisture Status

Decreased flooding has resulted in a negative impact on soil moisture in high and medium high lands in the project area. An effective drainage system might alleviate the problem but does not seem to exist at present. The low lying area remain saturated and have, therefore, not affected by the flood control structures, though water logging remain a serious problem. The overall impact is thus reported to be negative.

10.4 Biological Environmental Impacts

Biological environmental issues affected by the Baranai project have been examined largely in terms of impacts on flora and fauna. Most have undergone moderate or significant changes. The bio-physical impacts are summarised in Table 10.2.

10.4.1 Biological Impact (Fauna)

Insects, rats and mosquito population have increased due to more intensive crop cultivation, the increased shelter area, and stagnant water bodies. Insects and rats cause damage to crops. Rats dig burrows on the embankment causing damage to structures, which may breach during heavy flooding period. Mosquitoes spread diseases and cause serious health hazard. Stagnant waterbodies in the project area are the breeding ground for mosquitoes. Aquatic weeds which grow in stagnant water also facilitate mosquito breeding. Thus, a negative impact of the project is observed due to the survival and breeding of these hazardous organisms.

Table 10.2

Bio-Physical Environmental Changes in the Post Project Period

Bio-physical parameters	Percentages of villages experiencing post project change					
	Project area			Control area		
	Static	Increased	Decreased	Static	Increased	Decreased
Water-table elevation	17.6	-	82.4	-	-	100.0
Surface water pollution	58.8	11.8	29.4	100.0	-	-
Soil fertility	23.3	35.3	41.2	100.0	-	-
River erosion	58.3	25.0	16.7	100.0	-	-
Sedimentation in the river bed	63.6	9.1	27.3	100.0	-	-
Insect and pest attack	42.9	42.9	14.3	100.0	-	-
Prevalence of mosquitoes	37.5	50.0	12.5	-	100.0	-
Prevalence of snakes	29.5	11.8	58.8	100.0	-	-
Prevalence of rats	11.8	70.6	17.6	-	100.0	-
Prevalence of frogs	-	-	100.0	100.0	-	-
Prevalence of beneficial aquatic plants	-	-	100.0	-	-	100.0
Prevalence of harmful aquatic plants	-	-	100.0	-	-	100.0

Source: BIDS/SSISP Village Level Survey, 1992.

Loss of habitat due to extensive crop cultivation has also reduced the snakes and frogs in the project area. Increased use of pesticides have caused further decline in their population. This has been a negative impact of the project as decimation of their population has disrupted the food chain and degraded the environment.

Fishery in most of the FCD/FCDI projects has been adversely affected due to a decrease in water bodies and obstruction of free movement of the fish due to construction of embankment. In Baranai sub-project, also, similar problems have been encountered. Culture fishing or agro-fishing could have mitigated the problem but no concerted efforts have been taken in this respect.

10.4.2 Biological Impacts (Flora)

Tree population have registered an increase in the area, following the implementation of the Baranai project (Table 10.3). More fruit trees were planted in recent years due to more secure (flood-free) environment. Firewood is still short in number as the number of firewood chopped in recent years are not mostly replaced. However, other commercial trees have been planted extensively in the project area. This is not to say that massive afforestation has taken place. In fact, only in the homestead people have planted trees.

The number of species of aquatic plants (both varieties) have decreased due to reduced water bodies in the area. This may create an imbalance in the natural food chain system.

10.5 Human Environmental Impacts

10.5.1 Crop Cultivation, Cropping Pattern and Input Use

Due to enhanced security from flood risk and increased irrigation facilities, there has been intensification of crop cultivation following the implementation of the project. A major shift from local to HYV and from broadcast to transplanted varieties has taken place.

Table 10.3

Impact of Project on Plant Population

			Project	Control
Stock of Fruit Trees (Percentage of Villages)	:	Static	5.88	N/A
		Increased	64.71	N/A
		Decreased	29.41	N/A
Number of Fruit Trees (Average per Household)	:	Planted	2.22	3.68
		Chopped	0.29	0.04
Stock of Commercial Trees (Percentage of Villages)	:	Static	5.88	N/A
		Increased	59.94	N/A
		Decreased	41.18	N/A
Number of commercial trees (Average per Household)	:	Planted	1.02	0.92
		Chopped	0.05	0.08
Beneficial Aquatic Plants (Percentage of Villages)	:	Static	-	-
		Increased	-	-
		Decreased	100.00	100.00
Harmful Aquatic Plants (Percentage of Villages)	:	Static	-	-
		Increased	-	-
		Decreased	100.00	100.00

Source: BIDS/SSISP Village level and Household Survey, 1992.

With the dissemination of high yielding variety of crops, use of modern inputs such as fertilizer and pesticides has increased many-fold. This may result in toxicity in the soil and reduce soil fertility. Higher doses of chemicals, when leaches to the water source cause fish mortality and pollute the water and cause damage to aquatic fauna.

10.5.2 Livestock

Livestock population particularly cattle has declined in the project area due to paucity of grazing land and also supply of animal feed. Most of the grazing land are now used for crop cultivation. Moreover, the project area is now growing more HYV paddy, the straw of which is less nutritive and palatable. The amount is also less than the local varieties. Domestic poultry population, particularly chicken has increased in the project area due to enhanced security

from flooding, increased availability of foodgrain and other crops. Moreover, financial support from different NGOs has encouraged rural women to raise goats and chicken on a commercial basis. However, this is not a project impact.

10.5.3 Fishery

Capture fisheries has declined significantly in the project area both due to decrease in water bodies as well as over-exploitation of riverine fisheries. The embankment is preventing the migration of the fish fry and movement of fish in the late dry season. Moreover, the beels and other depressed areas and khals have been badly silted due to lack of run-off water, and proper maintenance. On the other hand, culture fishery has not improved in the project area. Although flood control has provided extra security for pond fish culture, the attitudes of the people for investing in culture fisheries has not yet been properly developed.

10.5.4 Fuel Availability

The sources from which fuel is obtained for domestic use are shown in Table 10.4. It is readily observed that in the project area the contribution of the two sources remain the same as before. In the control area, the contribution of the fuel derived from own source declined somewhat, while these gathered from (free of cost) outside has gone up by the same proportion. None of the households in either the project or control area, however, has to purchase fuel from the market. That the households experienced greater difficulty in getting fuel in the control area becomes more clear from the information presented in Table 10.5. Only about 5 per cent of the households in the project area reported difficulty in obtaining fuel as compared to 16 per cent in the control area. Thus, the household in the project area are somewhat better placed with respect to availability of fuels.

10.5.5 Water for Domestic Use

In the rural areas, tubewell water is considered to be the main source of safe drinking water. Information on the access to various sources of drinking water is presented in Table 10.6. It is observed that in the project area, about 80 per cent of the households have access to tubewell water either from own or

Table 10.4

Sources of Fuel in the Current and Pre-project Period

Farm Size (ha)	Percentage derived from each source at present		Percentage derived from each source before project	
	Own	Gathered (free of cost)	Own	Gathered (free of cost)
Project area:				
0.00 - 0.20	45.00	55.00	46.43	53.57
0.21 - 1.01	89.09	10.90	82.23	14.77
1.02 - 2.02	100.00	-	100.00	-
2.03 & above	89.29	10.71	85.71	14.29
All farms	63.73	36.27	63.25	36.75
Control area:				
0.00 - 0.20	20.00	80.00	30.00	70.00
0.21 - 1.01	82.67	17.33	90.00	10.00
1.02 - 2.02	100.00	-	100.00	-
2.03 & above	100.00	-	100.0	-
All farms	73.60	26.40	80.00	20.00

Source: BIDS/SSISP Household Survey, 1992.

Table 10.5

Difficulty in Getting Fuel at Present Compared to the Pre-project Period

Farm Size (ha)	Percentage of Households at Present Compared to the Pre-project Period				
	Quite difficult	Slightly difficult	Same	Easier	Total
Project area:					
0.00 - 0.20	2.0	4.1	91.8	2.0	59.0
0.21 - 1.01	-	4.5	77.3	18.2	26.5
1.02 - 2.02	-	-	100.0	-	6.0
2.03 & above	-	-	85.7	14.3	8.4
All farms	1.2	3.6	88.0	7.2	100.0
Control area:					
0.00 - 0.20	20.0	-	80.0	-	20.0
0.21 - 1.01	13.3	6.7	73.3	6.7	60.0
1.02 - 2.02	-	-	100.0	-	12.0
2.03 & above	-	-	100.0	-	8.0
All farms	12.0	4.0	80.0	4.0	100.0

Source: BIDS/SSISP Household Survey, 1992.

Table 10.6

Source of Drinking Water in the Current and Pre-project Situation

Farm size (ha)	Percentage of households reporting use of various sources at present						Percentage of households reporting use of various sources in pre-project period					
	Own pond	Own TW	Other's pond	Other's TW	River/ canal	Other sources	Own pond	Own TW	Other's pond	Other's TW	River/ canal	Other sources
Project area:												
0.00 - 0.20	-	10.2	18.3	60.7	10.4	-	-	2.04	19.0	61.7	17.2	-
0.21 - 1.01	0.9	49.1	6.8	43.2	-	-	0.9	17.3	9.6	70.0	2.3	-
1.02 - 2.02	-	80.0	-	20.0	-	-	10.0	-	20.0	56.0	14.0	-
2.03 & above	-	78.5	-	5.7	15.7	-	-	50.0	-	35.7	14.2	-
All farms	0.2	30.5	12.8	49.0	7.5	-	0.8	10.0	14.9	61.4	12.8	-
Control area:												
0.00 - 0.20	-	8.0	-	50.0	42.0	-	-	50.0	-	50.0	45.0	-
0.21 - 1.01	-	26.7	2.0	57.3	20.0	-	-	6.7	2.0	42.7	48.7	-
1.02 - 2.02	-	33.3	-	66.7	-	-	-	33.3	-	33.3	33.3	-
2.03 & above	-	100.0	-	-	-	-	-	100.0	-	-	-	-
All farms	-	29.6	1.2	48.8	20.4	-	-	17.0	1.2	39.6	42.2	-

Source: SSISP Household Level Survey, 1992.

other tubewells, as compared to about 70 per cent in the pre-project situation. Much of this is due to installation of own tubewells after the implementation of the project. Since the households in the control area experienced similar improvement, this cannot be directly attributed to the project intervention. However, as Table 10.7 indicates, in response to a direct querry about the difficulty towards access to safe drinking water, much larger percentage of households in the control area reported greater difficulty as compared to the pre-project situation.

Table 10.7

Changes in the Effort in Obtained Drinking Water During the Post-Project Period

Farm size (ha)	Per cent of households reporting post project situation as				
	Quite difficult	Slightly difficult	Same	Easier	Total
Project area:					
0.00 - 0.20	18.4	8.2	63.3	10.2	59.0
0.21 - 1.01	4.5	9.1	45.5	40.9	26.5
1.02 - 2.02	-	20.0	-	80.0	6.0
2.03 & above	14.3	-	57.1	28.6	8.4
All farms	13.3	8.4	54.2	24.1	100.0
Control area:					
0.00 - 0.20	40.0	20.0	40.0	-	20.0
0.21 - 1.01	46.7	13.3	40.0	-	60.0
1.02 - 2.02	33.3	-	33.3	33.3	12.0
2.03 & above	-	-	50.0	50.0	8.0
All farms	40.0	12.0	40.0	8.0	100.0

Source: BIDS/SSISP Household Survey, 1992.

10.6 Damage due to Natural Calamities

Floods, cyclone, droughts, pest attacks, water logging and similar other natural calamities tend to cause damages to crops and non-crops in both the project and control areas, as elsewhere in the country. However, with project intervention such has taken place in Baranai, one would expect the extent of

damage to be reduced arising out particularly of the incidence of floods. The extent of damage due to natural calamities for both crops and non-crops are presented in Tables 10.8 and 10.9. respectively. It is observed that although the project area is more exposed to pest attacks, the extent of damage due to floods and excessive rain/hail storm is much greater in the control area which does not have any flood control and drainage facilities. This is particularly evident in case of local aman where a direct comparison can be made. Total non-crop damages due to various natural calamities is evidently greater in the project area but adjusted for sample size (information were collected from 17 villages in project area as compared to only one in the control area), the difference would not appear to be that prominent. In fact in some cases (e.g. damage to roads and trees) the extent of damage is lower in the project area.

10.7 Adverse Impact of Project Structures

The incidence of adverse impacts associated with project structures are reported in Table 10.10. It is observed that 44 per cent of the villages surveyed reported some adverse impacts due to the construction of flood control embankments compared to 33 per cent for drainage canals and regulators. The nature of the problems associated with each of these structures are reported in Table 10.11.

Table 10.8

Crop Damage by Natural Calamities during 1398

Calamity	HYV Boro				HYV Aman				Local Aman				Jute				HYV Wheat			
	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)
Project Area:																				
Flood	-	-	-	-	15.54	2.44	2.06	0.38	24.27	1.60	1.07	0.53	1.74	0.13	0.01	0.12	-	-	-	-
Pest attack	2.26	1.17	1.05	0.12	6.19	0.78	0.65	0.13	4.14	0.66	0.45	0.21	-	-	-	-	-	-	-	-
Excess Rain and Hail Storm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Drought	5.00	1.20	1.07	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Calamity	HYV Boro				HYV Aman				HYV Wheat			
	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)	Damaged area (ha)	Normal yield (MT)	Actual yield (MT)	Loss (MT)
Control Area:												
Flood	-	-	-	-	28.34	2.22	1.11	1.11	-	-	-	-
Excess Rain and Hail Storm	85.02	6.47	4.62	1.85	-	-	-	-	20.24	2.22	0.74	1.48

Source: BIDS/SSISP village Level Survey 1992.

Table 10.9

Non-Crop Damage by Natural Calamities during 1398

Type of damage	Project area	Control area
Number of people dead	-	-
Number of people water marooned	350	-
Number of livestock dead	62	3
Number of poultry birds dead	1750	50
Number of houses damaged	194	12
Number of trees damaged	159	30
Value of roads damaged (000 Tk)	654	100
Value of other properties damaged (000 Tk)	512	-

Source: BIDS/SSISP Village Level Survey 1992.

Table 10.10

Incidence of Adverse Effects Associated with Project Structures

Type of Structure	Percentage of villages where problems experienced
Flood control embankment	44.4
Drainage canal and regulator	33.3

Source: BIDS/SSISP Village Level Survey 1992.

Table 10.11

Problems Reported with Specific Project Structures

Structure	Problems
Flood control embankment	1. Reduced soil fertility
	2. Decreased fishing opportunities
	3. Water logging often flooding
Drainage canal and regulators	1. Boating problems
	2. Fishing problems

Source: BIDS/SSISP Village Level Survey 1992.

CHAPTER 11

CONCLUSIONS AND POLICY RECOMMENDATIONS

The major conclusions that emerge from the socio-economic evaluation of Baranai river project will be highlighted in this Chapter, with a view to suggesting general policy measures, as well as making specific policy recommendations which has a close bearing on planning, designing, implementation, as well as operation and maintenance of the project in order to realize the stipulated project benefits.

Our enquiry into the performance of project structures as well as management of Baranai project reveal quite a number of areas where appropriate measures are required for improved effectiveness and better functioning of the project. Some of these are mentioned below.

(a) Measures should be taken to remove drainage congestion in the areas under Bhasbhag regulator constructed on the Hoja river. This can be achieved by pumping excess water using high capacity pumps since the water cannot be drained out by gravity flow.

(b) Flood embankment should be made failure proof by earth-filling, turfing, planting etc every year. This should be considered a routine work.

(c) The drainage channels needs re-excavation, re-sectioning and realignment every year.

(d) Participation of beneficiaries in the project operation and management through Regulator Committee should be further encouraged.

(e) Spare parts of irrigation equipment, particularly STWs should be made readily available for smooth functioning of the project.

(f) The government should initiate measures for fostering inter-agency cooperation among BADC, BRDB and DAE, who presently operate their own programme quite independently in the project area, without any coordinating efforts in order to derive fully the potential benefit from the project.

An assessment of agricultural impact of the Baranai project has demonstrated substantial improvement in agricultural productivity, primarily through acreage expansion of HYV aman and boro in the project area. In particular, the project has achieved considerable success in protecting the monsoon crops, and bringing about a shift of cropping pattern in favour of HYV in the aman season. This is reflected in the average yield and acreage devoted to the cultivation of aman paddy in the project area, as compared to both the control area and the pre-project situation. There is, however, further scope of expansion of HYV aman through removal of drainage congestion in the north-western part of the project area. Drainage problem is also partly responsible for the low coverage of rabi crops, particularly cultivation of oilseeds in the project area.

The gains in agricultural productivity has been reflected in higher income and greater employment opportunities in the project area. However, the increase in income has been mostly confined in the top income categories. There is hardly any difference in average household income among the low-income groups between the project and the control area. This is often expected in case of dissemination of HYV technology if the benefit of wage employment and non-agricultural employment do not substantially accrue to landless and marginal group of farmers. In that case, it become necessary to supplement project activities by suitable programmes for employment and income generation for landless and marginal farmers. Secondary gains in agricultural productivity is reflected in a higher value of agricultural assets and greater marketed surplus thereby indicating greater scope of trading activity and commercialization in the project area.

Although the yield rates for most crop varieties are higher in the project area, compared to both control area and pre-project situation, these are still

lower than what has been targetted in the project document. There is thus scope for improvement in yield through more balanced application of inputs. The application of fertilizer is low for a number of crops thereby pointing to the scope of increased application. Also, for those crops currently using large doses, there may be scope of more balanced use of different types of fertilizers. DAE can play a useful role in this respect.

A decline in the livestock population, particularly cattle has been observed in the project area. This decline can be attributed at least partly to expansion of HYV paddy acreage, which had a negative impact on pasture/grazing area and availability of animal feed. Appropriate measures, therefore, are needed for planned development of livestock in the area. In addition to popularizing better breeding of cattle, the problem of livestock feed should be addressed through development and selection of HYV paddy for straw quality, extensive use of urea treatment of straw and introduction of urea-molasses blocks.

The construction of embankment and other project structures, has caused a serious decline in open water capture fisheries, presumably due to reduction in water bodies and blocking of fish migration routes. No compensating benefits have so far been derived in terms of promotion of culture fisheries/fish farming, despite improvement in flood-free environment. This must be undertaken on a priority basis to meet the nutritional requirements of the population.

The embankment structures and the consequent flood-free environment that have been created can be profitably utilized for development of social forestry in the area. The initiative may be taken by BWDB as a regular feature of its O & M activities. A local committee may be formed for implementation of the afforestation programme.

Based on the evaluation experience of Baranai river sub-project, it is possible to make some general observations, which may have important implications for future planning, designing, implementation as well as operation and maintenance of small scale water development projects in Bangladesh. These are noted below.

To begin with, the successful attainment of project objectives largely depend on proper planning and project implementation requiring both 'top down' and 'bottom up' approaches. Local involvement and links to local bodies have seldom been maintained, with no adequate institutional mechanism for coordination of such efforts. As such, the project designed without peoples' participation have revealed inadequate analysis of environmental/educational impacts as well as externalities and spill-overs, and various conflicts and complementarities among different groups of the affected population. This calls for some fundamental changes in the way such small scale projects are conceived, planned, implemented and operated/maintained in order to ensure adequate local inputs and proper interface and linkages with local institutions, related agencies and project beneficiaries.

Secondly, it is important to realize that the creation of project structures only change the physical environment, which facilitate the adoption of technological and other improvements perceived under the project. However, their actual adoption critically depends on factors, which affect the decision-making environment of the farmers, which are often neglected in water development projects. This, therefore, calls for designing and implementation of an integrated and coordinated plan of action considering the current impacts and establishment of a regular monitoring and evaluation mechanism encompassing critical parameters related to socio-economic and environmental impacts of the project.

Finally, it has been observed that improvement in agricultural productivity and associated changes in economic conditions were not sufficient to bring about any significant changes in social aspects related to education, health, women's status etc. Not only investment in human capital is small in the project area, the current level of educational attainment is quite low. Education can play an important role in the adoption of improved agricultural practices. Education and literacy is also expected to bring about attitudinal changes, which will enhance the level of investment in human capital and improve the status of women. Therefore, development projects such as these should be accompanied by programmes for functional literacy and investment in social infrastructure. NGOs operating in the area may be involved in this process.

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